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EXPERIMENT STATION RECORD

VOL. 79 JULY–AUGUST 1938 No. 1–2

SOME EXPERIMENT STATION CELEBRATIONS OF THE HALF CENTURY UNDER THE HATCH ACT

Reference has already been made in these columns (E. S. R., 78, pp. 1, 145) to the formal observance of the fiftieth anniversary of the Hatch Act by the Association of Land-Grant Colleges and Universities at its 1937 convention. This collective commemoration has since been supplemented by individual activities in several of the States. In at least two of these, West Virginia and Illinois, they have taken the form of a celebration of the stations' own fiftieth anniversaries, with a third, Missouri, in preparation. Other stations have incorporated a review of their history and work in their current annual reports or have issued separate commemorative publications.

The first of the States to present a formal anniversary program in 1938 appears to have been West Virginia. This observance took place on January 11 in connection with the Farm and Home Week program of the College of Agriculture of the university. Sickness prevented the appearance on the program of two of its veteran workers, Dr. A. D. Hopkins and Mr. W. E. Rumsey (since deceased), but among other features a comprehensive review, entitled High-Lights of a Half Century, was given by Director F. D. Fromme (now with the Office of Experiment Stations). Dr. Fromme presented many interesting facts regarding the early days when the station "began life as a foundling in an atmosphere that was apathetic, even somewhat hostile," the substantial assistance rendered to extension work and resident teaching and along inspection and other service lines, the evolution of real research, the growth in personnel, buildings, land, and equipment, and some of the outstanding developments. In conclusion he spoke as follows:

"The past half century has witnessed many changes of a revolutionary character in agriculture. Among these we may note a threefold gain in the labor output of the farmer which has released labor for industrial enterprises and lowered production costs; a marked reduction in the hazards of production brought about by the control of diseases and pests of domestic animals and crop plants, and the

development of hardy, high-yielding varieties and breeds; the more exact knowledge of the nutrition of animals and plants which has replaced rule-of-thumb practices; the maintenance and even augmenting of yields despite the natural trend of soil wastage and depletion; a great improvement in the quality of products and the newer knowledge of the health promoting qualities of foods; [and] the introduction of new crops for food and industrial uses replacing the few staples of early days, [whereby] the average American home of today is supplied with an abundance, variety, and quality of food without parallel in the history of the world. As one of the units of a system of public research agencies, the West Virginia Agricultural Experiment Station has played its part in bringing these far-reaching and beneficial changes to pass."

On March 25 the Illinois Experiment Station observed its fiftieth anniversary with an afternoon program and a commemorative dinner. The speakers at the former included the station leaders for the past 43 years—former Director Eugene Davenport (1895–1922), who told of The Early Years, and the late Director H. W. Mumford (1922–1938), who discussed A Half Century of Achievement. The exercises closed with an address by Director T. P. Cooper of the Kentucky Station entitled Milestones of Progress. At the dinner brief talks were given by three Illinois farmers and a farm wife on the topic, As We View the Station's Work, with the principal speaker the Undersecretary of the U. S. Department of Agriculture, Dr. Milburn L. Wilson. Dr. Wilson's address was entitled The National Influence of the Illinois Station, and in it he said in part:

"At no time in the history of the world has change been as great as it has been in these last 50 years due to this march of science. Had there not have been scientific research in agriculture, farming and the farm population would have tended to lag behind the rest of society in their control over nature. As it is, agricultural science has advanced as rapidly as has science in its other applied fields. The investment which society has made in this agricultural research has paid great dividends. It has benefited the farmers and agriculture as well as consumers and society as a whole. From a cold-blooded investment standpoint it has been a tremendous success."

The traditional gold of the fiftieth anniversary adorns the covers of the annual reports received from the stations in Colorado, Pennsylvania, and South Carolina. The fiftieth report of the [New York] Cornell Station also is described as "a historical résumé of the development of agricultural research during this period, together with a statement of the objectives and accomplishments attained," and more or less reference is made in the reports from Maryland and [Connecticut] Storrs.

For South Carolina little history is attempted, reference being made instead to the circular entitled The South Carolina Experiment Station: A Brief History (E. S. R., 65, p. 496). However, among the achievements of the station are cited the introduction of new and improved varieties of plants, better livestock, more effective methods of insect and disease control, advances in soil conservation and improvement, and the advocacy of higher standards of living in the home, more libraries, more equitable taxation, and more efficient systems of farming.

The Pennsylvania Station report discusses the 50-year period in considerable detail. Among the factors contributing to the station's progress is mentioned the permanency of its leadership under only three directors—Armsby from the beginning until 1907, Hunt until 1913, and Watts thereafter. "This has favored continuity of policy and has promoted efficiency." Attention is also called to the broadening objectives of the station, now visualized as follows: To reduce the cost of producing farm crops and livestock through the development of more efficient methods; to improve the quality and marketability of farm produce; to expand the uses and to find new outlets for farm products; to conserve the land and water resources of Pennsylvania; to promote a satisfying rural life; and to advance the boundaries of knowledge of the sciences which enter into the practice of agriculture.

From Cornell comes a comprehensive discussion of accomplishments, mainly along subject-matter lines. Here, too, the small number of directors has been noteworthy—Roberts (1887–1903), Bailey (1903–13), Galloway (1914–16), Mann (1916–31), and Ladd (1932–). A measure of what the station has done is afforded by a table giving a total of 678 bulletins and 205 memoirs. In addition, of course, there have emanated from the station a very large number of articles in scientific and other journals.

The Colorado Station prefaced its annual report with a brief retrospective account of the first half century, and also supplemented this with a separate publication entitled Accomplishments of the Colorado Experiment Station, noted on p. 143. This publication reviews the achievements in agronomy, animal husbandry and diseases, range and pasture management, botany, poultry husbandry, horticulture, entomology, irrigation and other phases of engineering, chemistry, rural economics and sociology, and home economics, and makes a plea for continued development. "We are facing," it points out, "new problems in agriculture; old theories and practices are being discontinued. Land use can no longer be considered from the individual standpoint but from that of the State and Nation. We

are becoming land conscious. Soil conservation, with its implied land use, must be studied and pursued from the standpoint of the future as well as the present. Land-ownership must be looked upon as a trusteeship in which future generations have an interest. Agriculture must be stabilized, and as far as possible speculative hazards reduced. These adjustments call for the solution of many problems both in the field of economics and in the field of production. It further means that the experiment station must adjust its program to meet these new demands. While fundamental agricultural research must always be carried on as the main work of the experiment station, we should not forget the more pressing problems that the new order calls for if we are to be of the greatest possible service to the State."

The contribution of the Oregon Station likewise took the form of a special booklet, The First Fifty Years of the Oregon Agricultural Experiment Station, 1887–1937 (E. S. R., 78, p. 286). This attractive publication presents a chronology of items selected from the annual reports to indicate the nature and scope of the work through the years, but consists mainly of illustrations depicting 15 of the most outstanding individual or closely related accomplishments. These are enumerated as the discovery of a successful method of removing spray residue from fruit; discovery of the cause and control of Bang's disease; development of the Oregon small-seed industry; development of a system of breeding poultry for egg production; development of a practical method of brining cherries for the maraschino trade; detailed soil surveys and classification of major farming areas in Oregon; discovery of a new and simple method of fowl pox control; introduction of important grain varieties, particularly Federation wheat and Markton oats; research leading to the improvement of Oregon butter quality; development of new methods of storing, ripening, and marketing Oregon pears; discovery of the life history and control of the codling moth under Oregon conditions; control of liver flukes in sheep and goats; development of supplemental irrigation in western Oregon; discovery of the value of sulfur as a fertilizer; and control of pear blight. It is also pointed out that "scores of other accomplishments, many of equal significance but less readily presented in this form, could be cited."

Recapitulations and reviews of similar scope are doubtless in preparation at other stations, and the coming months may bring reports of further commemorative programs. Taken as a whole, they should make a substantial and impressive showing. It would be helpful if all the material thus made available could be consolidated and utilized as the basis of a single comprehensive history for the stations as a group during the 50 years of their existence.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Annual review of biochemistry, V, VI, edited by J. M. Luck (*Stanford University, Calif.: Stanford Univ. Press, 1936, vol. 5, pp. IX+640, [fig. 1]; 1937, vol. 6, pp. IX+708, figs. 4*).—The plan followed in the volumes noted previously (E. S. R., 73, p. 868) is continued in these two volumes, which contain review papers by different authors on topics in the field of biochemistry.

Topics pertaining to nutrition in volume 5 include, in addition to those noted in the earlier volumes, X-Ray Studies on the Structure of Compounds of Biochemical Interest, by O. L. Sponsler and W. H. Dore (pp. 63–80); The Chemistry of the Acyclic Constituents of Natural Fats and Oils, by T. P. Hilditch (pp. 101–116); and Clinical Applications of Biochemistry, by J. P. Peters, C. L. Robbins, and P. H. Lavietes (pp. 295–314).

In volume 6 the new topics include The Application of Microchemistry to Biochemical Analysis, by P. L. Kirk (pp. 73–98); The Chemistry of the Steroids, by R. Schoenheimer and E. A. Evans, Jr. (pp. 139–162); and Detoxication Mechanisms, by A. J. Quick (pp. 291–302). A subject index is included in this volume.

Laboratory gas-absorption vessels, W. M. Martin (*Indus. and Engin. Chem., Analyt. Ed., 8 (1936), No. 5, pp. 395, 396, fig. 1*).—The author of this contribution from the Montana Experiment Station shows the construction of a convenient and efficient gas scrubber designed to supply a continuous stream of purified air or other gas, especially useful in preparing large volumes of carbon dioxide-free distilled water by the aspiration method, and a quantitative absorption vessel in which the absorbing solution is titrated directly, "thus obviating the errors which inevitably occur when aliquots are removed for titration. This is an especially important consideration in titrating alkaline solutions to an alkaline end point." The gas to be determined is passed through the apparatus charged with the absorbing solution, which is then titrated by connecting the absorber to the scrubber shown. The stream of carbon dioxide-free air effectively stirs the solution and circulates it in the absorber during titration, while at the same time the countercurrent of air prevents carbon dioxide and other interfering atmospheric gases from diffusing into the vessel.

Glass head for a laboratory water still, P. F. Sharp and E. B. Struble (*Indus. and Engin. Chem., Analyt. Ed., 8 (1936), No. 4, p. 316, fig. 1*).—The authors have devised, at Cornell University, a distillation head and condenser consisting, in the case of a still having a capacity of 8 l per hour, of a 5-l Pyrex flask resting upon suitable supports in a copper pan, the neck of the flask being inclined slightly downward from the horizontal to connect, through a stopper, with the outlet tube of the steam vessel. A delivery tube for the distillate is sealed into the side of the condensing flask at its lowest point, passes vertically downward through a stopper in the center of the bottom of the copper pan, and is surrounded by a jacket to prevent any leakage from the pan from reaching the outlet tube into which the delivery tube discharges the distilled water. The copper pan is provided with a drain tube to carry off the cooling water, which flows over the surface of the condenser flask from a tube centered over its highest point.

"The curved neck and the return of a small amount of the condensed water reduce entrainment. The transparency of the condenser permits the inspection

of its operation. The condensing surface is large. The cooling water cannot enter the distilled water supply. The condenser can be readily cleaned."

Check valve for wash bottles, F. H. SMITH (*Indus. and Engin. Chem., Analyt. Ed., 8 (1936), No. 5, p. 400, fig. 1*).—The use of glass valves in the air tube and delivery tube is reported from the North Carolina Experiment Station.

Special head for Kjeldahl distillation apparatus, C. E. WEAKLEY, JR. (*Indus. and Engin. Chem., Analyt. Ed., 8 (1936), No. 5, p. 367, figs. 2*).—The author of this note from the West Virginia Experiment Station shows the constructional detail of a metal distillation head charged with glass beads. The metal surfaces with which ammonia can come into contact are tinned copper, solder, and pure tin. The head is so supported in a wooden framework as to give added protection against loosening of the flask or its stopper during distillation. A dimensioned drawing accompanies the note, and a photograph shows the use of the apparatus in connection with a standard six-flask distillation rack.

Fat-extraction apparatus for feeds, C. E. WEAKLEY, JR. (*Indus. and Engin. Chem., Analyt. Ed., 8 (1936), No. 5, pp. 388, 389, figs. 3*).—A note from the West Virginia Experiment Station shows the construction of a compact, rugged, and easily operated unit which is very economical of solvent, requiring 0.2 kg of ether for 20 determinations if no recovery is made. A battery of 20 extractors is shown.

Some modified extraction apparatus (abstract), C. E. WEAKLEY, JR. (*W. Va. Univ. Bul., 35. ser., No. 15 (1935), p. 114*).—This apparatus is noted above.

The design of a precision photoelectric colorimeter, R. B. WITHROW, C. L. SHREWSBURY, and H. R. KRAYBILL (*Indus. and Engin. Chem., Analyt. Ed., 8 (1936), No. 3, pp. 214–219, figs. 9*).—The authors of this contribution from the Indiana Experiment Station discuss the principles involved in the design of precision photoelectric colorimeters and describe an instrument which is based upon these principles and has the following characteristics:

"The complete colorimeter consists of three units—colorimeter unit, dial decade bridge, and galvanometer—either wall or portable type depending upon the sensitivity required. In measuring transmittancy, the instrument has an absolute accuracy of the order of 1 percent and a reproducible accuracy of 0.1 percent. The accuracy of the instrument inherently depends only upon the retention of the linear response of the photoelectric cells, and it is independent of other gradual changes in characteristics. The calibration is not appreciably affected by changes in lamp source or in line voltage fluctuations. Fluctuations of ± 5 v are not detectable in the operation of the instrument. The colorimeter reads directly in percentage transmission. The instrument exhibits no lag effects."

Determination of basic nitrogen: A semi-micromethod applicable to plant tissues, W. W. UMBREIT and P. W. WILSON (*Indus. and Engin. Chem., Analyt. Ed., 8 (1936), No. 5, pp. 361, 362*).—A semimicromethod for basic nitrogen, estimating basic nitrogen contents of from 2 to 5 mg of nitrogen with a difference of 5 percent or less between duplicates, applicable to plant materials is described in a contribution from the University of Wisconsin. The method is independent of reasonable variation in acid concentration, reagent concentration, and salt concentration, but dependent upon preliminary treatment and temperature. Quantitative recoveries of added basic materials were obtained. The method involves removal of the heat coagulable proteins, enzymic hydrolysis of the remaining peptides, hydrolysis of amides by means of sodium bisulfite, removal of the resulting ammonia by aeration, a modified form of the precipitation with phosphotungstic acid, and the determination of the nitrogen content of the washed precipitate.

Application of the chlorate method for determining nitrogen to light, fluffy materials, E. M. Emmert (*Plant Physiol., 12 (1937), No. 4, pp. 999–1001*).—To avoid carbonization of coarse, fluffy samples while floating on the surface of the oxidizing solution, with loss of nitrogen, the author of this note from the Kentucky Experiment Station treats a sample of from 100 to 1,500 mg of dry or green tissue with 2 cc of 50 percent sodium chlorate solution for each 100 mg of the dry or 500 mg of the green sample, allowing the chlorate solution to soak into the sample for a few seconds before adding the sulfuric acid and heating.

A new reagent for potassium.—I, Qualitative, A. W. Clark and C. O. Willits (*Indus. and Engin. Chem., Analyt. Ed., 8 (1936), No. 3, pp. 209, 210*).—At the New York State Experiment Station, 2,4-dinitro-1-naphthol-7-sulfonic acid in the form of its sodium salt, or naphthol yellow S, has been shown to be of value as a precipitant for potassium, with the advantage over other potassium precipitants that it does not precipitate also the ammonium ion. The new reagent was shown to be capable of detecting 1 part of potassium in 2,500 parts of solution.

"To 10 ml of the aqueous solution to be tested, containing only the soluble group, add 3 ml of a 2 percent solution of naphthol yellow S and set aside at room temperature. The appearance of a precipitate in 65 min. or less will indicate the presence of 0.79 mg of potassium or more per milliliter of reaction mixture. As an alternative procedure, 3 ml of a 5 percent solution of the reagent may be used, with a blank test run under the same conditions. The appearance of a precipitate in 20 min. or less at room temperature will indicate the presence of 0.39 mg or more of potassium per milliliter of reaction mixture."

Determination of small amounts of potassium by means of silver cobaltinitrite, R. J. Robinson and G. L. Putnam (*Indus. and Engin. Chem., Analyt. Ed., 8 (1936), No. 3, pp. 211–213; abs. in Chem. Abs., 30 (1936), No. 12, p. 4116*).—"By employing a silver cobaltinitrite precipitating reagent and running potassium standards simultaneously, the minimum quantity of potassium determinable is reduced to about 0.002 mg. Precipitation should be allowed to take place near 0° C. and an acetone wash liquor used. This method was found to be applicable to the determination of potassium in fresh water."

Spectrographic microdetermination of zinc, A. P. Vanselow and B. M. Laurance (*Indus. and Engin. Chem., Analyt. Ed., 8 (1936), No. 4, pp. 240–242, figs. 3*).—The authors have developed, at the California Citrus Experiment Station, a quantitative spectrographic method for zinc in plant material. The range of the method is from about 1 to 100 p. p. m., or more, depending on the size of the sample used. Cadmium is used as the internal standard, the zinc and cadmium being coprecipitated as the sulfides and placed in the positive electrode of a graphite arc. "No other elements are present in the sulfide precipitate in amounts sufficient to cause interference. The maximum deviation from the mean of duplicate analysis is about one part in five."

A new colorimetric procedure adapted to selenium determination, K. W. Franke, R. Burris, and R. S. Hutton (*Indus. and Engin. Chem., Analyt. Ed., 8 (1936), No. 6, p. 435, figs. 2*).—A method by which colored precipitates of colloidal fineness can be filtered onto a mat of barium sulfate is described in a contribution from the South Dakota Experiment Station. Permanent standards are produced, and turbidity difficulties are removed. The procedure has been used for the estimation of from 0.005 to 0.15 mg of selenium with an accuracy of from 0.001 to 0.01 mg.

A method for the determination of the organic phosphorus of soils, S. R. Dickman and E. E. De Turk (*Soil Sci., 45 (1938), No. 1, pp. 29–39, pl. 1*).—A

method based upon decomposition of the soil organic matter with hydrogen peroxide and subsequent extraction of the phosphates thus set free by means of 0.2 N sulfuric acid is presented from the Illinois Experiment Station.

"Weigh in quadruplicate a 1-g sample of 35-mesh soil into a 500-ml Erlenmeyer flask graduated at 200 ml. Each set of two is a duplicate determination. Add 15 ml distilled (phosphorus-free) hydrogen peroxide to each of two of the flasks. Then add water until the total volume in all is 30 ml. Shake the flask thoroughly so that the soil is well mixed and wetted by the solution. Place the flask on the steam bath and turn the steam on high so that it flows freely around the bottom of the flask. Shake the sample again at the end of 15 min. After an additional 15 min. remove from the steam bath and add about 100 ml of water, then add 20 ml of 2 N sulfuric acid, and finally make up to 200 ml with water. Stopper, place in a shaker, and shake for 1 hr. Filter carefully, being sure that no trace of sediment occurs in the filtrate. Pipette a suitable aliquot into a 250-ml beaker and evaporate on the steam bath until only a residue of sulfuric acid remains. Dilute to 50 ml with water, add 1 drop of *p*-nitrophenol indicator solution and 1+1 ammonium hydroxide until the solution turns a faint yellow. Add just enough 2 N sulfuric acid to make the solution colorless again. This technic adjusts the pH to about 3.

"Add 2 ml ammonium molybdate-sulfuric acid solution, shake, then add 3 drops of stannous chloride and shake again. This solution is poured into a 100-ml Nessler tube. The standard is made up as follows: Pipette 5 ml of a 5 p. p. m. phosphorus solution into a 300-ml Erlenmeyer flask, add ammonium hydroxide and sulfuric acid to give the same amount of ammonium sulfate per milliliter as in the unknown, and adjust to pH 3 as before. Dilute the standard to 96 ml. Since the standard is twice the volume of the unknown, 4 ml of molybdate-sulfuric acid reagent and 6 drops of stannous chloride are added to it. The final volume of the standard is 100 ml. Pour the developed standard into a 100-ml graduated cylinder. Hold both the Nessler tube containing the unknown and a similar empty one vertically over a white paper background. Pour the standard solution into the empty Nessler tube until the colors of the two solutions match. The reading is the number of milliliters of standard required to equal the depth of color of the unknown.

"This method of developing and reading the phosphate solutions is patterned after the one suggested by Truog [E. S. R., 64, p. 312], and his precautions should be observed."

A simple method of estimating total sulfates in soils and irrigation water, A. N. Puri and A. G. Asghar (*Soil Sci., 45 (1938), No. 1, pp. 41–45*).—This method depends upon the reaction of an alkali metal sulfate with barium carbonate. The reaction is carried to completion by titrating the alkali metal carbonate as formed to the neutral point of thymolphthalein, the carbon dioxide being boiled out periodically until further boiling no longer produces alkali carbonate to give a blue color with thymolphthalein. Calcium salts must be removed before the sulfate titration, but magnesium salts cause no interference.

"If calcium salts are present, as indicated by the appearance of a white precipitate on the addition of ammonium carbonate followed by warming, add solid ammonium carbonate to an aliquot of the solution, warm to 60° C., and filter. The precipitate is washed twice with warm water, and the filtrate is evaporated to half the volume, all the free ammonia thus being driven out. Then 20 to 30 cc of 0.1 N NaOH is added, and the boiling is continued for about half an hour. Thymolphthalein indicator is added, and the excess of sodium hydroxide is titrated against standard hydrochloric acid. The decrease in the concentration of the sodium hydroxide added is equivalent to the calcium salts present in the solution. . . . After the preliminary separation of calcium salts,

the sulfates in the filtrate are estimated by the method previously described . . .

"The method . . . has been found very useful for estimating sulfates in saline-alkali soils. Obtaining a clear filtrate from such soils is generally difficult. Filtration through porous candles under pressure is the most efficient method, but it is extremely cumbersome. We have had very satisfactory results in extracting with normal ammonium carbonate. The soil is flocculated and can be filtered through ordinary filter paper. Another advantage of ammonium carbonate solution lies in the fact that exchangeable sodium, which is a normal feature of such soils, is determined in the same filtrate.

"Twenty g of soil is shaken with 200 cc N $(NH_4)_2CO_3$ for 2 hr. and filtered. One hundred and fifty cc of the filtrate is evaporated to dryness. The residue is taken up with hot water and is filtered. The filtrate is made up to 100 cc. Half of the filtrate is titrated for total alkalinity, methyl orange being used as indicator. This value is equivalent to exchangeable sodium and potassium in the soil. Hydrochloric acid equivalent to this alkalinity is added to another aliquot of the filtrate, which is then titrated for sulfates after the addition of $BaCO_3$."

A rapid method for determining carbon in the carbohydrate and protein compounds in plant tissue, E. M. Emmert (*Soil Sci., 45 (1938), No. 1, pp. 67–70*).—A method reported from the Kentucky Experiment Station is based upon the fact that "when a carbohydrate or protein is heated with sulfuric acid carbonization takes place, and the depth of color of the liquid is sensibly proportional to the amount of carbon present. Inasmuch as virtually all the carbon of plant tissue, especially vegetative tissue, is in the form of carbohydrate and proteins, and the proportion of carbon compounds that are not charred, such as oxalic acid or stable aromatic compounds, is very small, the color produced by charring with sulfuric acid should be a good index of the amount of carbon in the carbohydrates and proteins present. If it is known that nothing but carbohydrate or protein or substances which are completely charred are present, it is an accurate method for determining total carbon."

Isolation and determination of starch in plant tissue, C. Niemann, R. H. Roberts, and K. P. Link (*Plant Physiol., 10 (1935), No. 3, pp. 579, 580*).—At the Wisconsin Experiment Station, "in the course of a microchemical study on the reserve carbohydrates of apple wood spurs, it was noticed that after the tissue had been treated with a boiling solution of 1 percent nitric acid in 85 percent ethanol the starch granules could be dispersed in boiling 20 percent ethanol." A quantitative method based on this observation was then developed. The starch polysaccharides were found to be precipitated from the 20 percent alcohol by concentrating this extract to a small volume under diminished pressure and adding the concentrate to 10 times its volume of a mixture of equal parts of acetone and alcohol. For the estimation of the starch, however, the authors prefer to concentrate, hydrolyze with hydrochloric acid, and determine glucose.

Determination of starch in plant tissues, G. W. Pucher and H. B. Vickery (*Indus. and Engin. Chem., Analyt. Ed., 8 (1936), No. 2, pp. 92–97; abs. in Chem. Abs., 30 (1936), No. 9, p. 2880*).—An accurate colorimetric method has been developed at the Connecticut [New Haven] Experiment Station, Rask's hydrochloric acid extraction (E. S. R., 57, p. 204) being combined with measurement of the intensity of the blue color of the iodine-starch complex by means of a spectrophotometer and a light filter transmitting a band of wavelengths strongly absorbed by the starch-iodine suspension. A procedure involving extraction with hot concentrated calcium chloride solution is also described. The method is designed for samples of dried plant tissue.

Determination of reducing sugars and sucrose in plant materials, W. Z. Hassid (*Indus. and Engin. Chem., Analyt. Ed., 8 (1936), No. 2, pp. 138–140*).—In

a procedure developed at the University of California the reducing sugars are oxidized with alkaline potassium ferricyanide, and the ferrocyanide formed in the reaction is titrated in acid solution with ceric sulfate, which oxidizes the ferrocyanide back to ferricyanide. The indicator used for the titration is o-phenanthroline ferrous sulfate. Using five different dry plant materials and squash sap, the author obtained results from 0 to about 5 percent higher by this method than by the Munson-Walker method. The method was found rapid and convenient.

Quantitative determination of 5-methyl furfural, H. A. Iddles and K. S. French (*Indus. and Engin. Chem., Analyt. Ed., 8 (1936), No. 4, pp. 283–285, fig. 1*).—At the University of New Hampshire it has been shown to be possible to determine 5-methyl furfural, produced like furfural from any methyl pentoses or methyl pentosans present in the natural materials from which furfural is prepared, by introducing an empirical correction factor for solubility of the phloroglucide precipitate. It was also shown that 5-methyl furfural precipitates quantitatively with thiobarbituric acid or more satisfactorily with 2,4-dinitrophenylhydrazine.

Determination of volatile fatty acids by the partition method, O. L. Osburn, H. G. Wood, and C. H. Werkman (*Indus. and Engin. Chem., Analyt. Ed., 8 (1936), No. 4, pp. 270–275, figs. 3*).—The partition method described by Werkman (E. S. R., 67, p. 356) has been modified at the Iowa Experiment Station to meet the demands of fermentation research.

Procedures for the determination of the acids in two-acid mixtures by using one partition constant are given. By the additional use of a second partition constant it is possible to detect the preesnce of acids other than the two acids assumed to be present. Nomographic methods are used. The two partition constants may also be used to determine the acids in three-acid mixtures. Procedures for the detection of large errors in the analysis of three-acid mixtures by the further use of two additional partition constants are given. If formic acid is present in any of the acid mixtures, it is determined separately and treated as a known quantity. The other acids are determined in the presence of formic acid.

A photometric method for the determination of the colour of cooked potatoes, P. Bilham, A. E. Maunsell, and L. H. Lampitt (*Jour. Soc. Chem. Indus., Trans., 56 (1937), May, pp. 165T–168T, figs. 7*).—By the method described in this paper the color of the potato is matched on a Pulfrich photometer against one of a series of six cards, ranging from creamy white to deep yellow in color, and the amount by which the reflected light from the card has to be diminished to equal the intensity of the potato sample is a measure of the grayness. The test was devised to provide a grading system for potatoes showing a tendency to blacken on cooking. The accuracy obtained is not high, but better results are obtained than by a method in which the unaided eye is used.

A new photoelectric method for measuring vitamin A, R. L. McFarlan, J. W. Reddie, and E. C. Merrill (*Indus. and Engin. Chem., Analyt. Ed., 9 (1937), No. 7, pp. 324–326, figs. 4*).—A new instrument is described for measuring quantitatively the absorption of light in the region of 3,280 a. u. by means of photoelectric cells. Determinations made on several oils by this instrument are compared with determinations made by a spectrophotometer, and the readings are shown to agree within the limits of experimental error. By this method the results are reproducible, the personal factor is eliminated, the readings are rapid and easy to secure, and any errors due to change in light intensity are eliminated by the use of the two phototubes.

The quest of vitamin B_1, R. R. Williams (*Jour. Franklin Inst., 224 (1937),*

No. 5, pp. 541–553).—The author discusses the historical background leading to the isolation of vitamin B_1, the study of its chemical nature, and its synthesis.

The chemical measurement of vitamin B_1 in foodstuffs and biological material by means of the thiochrome reaction, M. A. Pyke (*Biochem. Jour., 31 (1937), No. 11, pp. 1958–1963, fig. 1*).—The reliability of the chemical method for determining vitamin B_1 by converting it into thiochrome and measuring the fluorescence of the thiochrome was tested on a series of vitamin B_1 concentrates extracted from rich polishings, a solution of the pure vitamin, and various foodstuffs, including milk, animal tissues, and urine, and the results obtained are reported to be satisfactory. The following vitamin B_1 values are noted: Milk 0.25 international unit per cubic centimeter, ham 2.4, wheat germ 10.7, dried brewers' yeast 13, egg yolk 1.6, egg white 0, rice bran 5.4, rat liver 0.8, kidney 0.2, and muscle 0.6, and urine absorbed on fuller's earth 10 international units of vitamin B_1 per gram.

The estimation of vitamin B_1 in blood by a modification of Schopfer's test, A. P. Meiklejohn (*Biochem. Jour., 31 (1937), No. 9, pp. 1441–1451, figs. 2*).—A method is described for the estimation of vitamin B_1 in small samples of oxalated blood by measuring the growth-promoting activity over a 10-day period of the vitamin on a mold, *Phycomyces blakesleeanus*, at an initial pH of 6.5–6.7. Other substances such as bios, mannitol, and thiochrome, possessing growth-promoting activity, were found to be without influence on *Phycomyces*.

A fermentation test for vitamin B_1, A. Schultz, L. Atkin, and C. N. Frey (*Jour. Amer. Chem. Soc., 59 (1937), No. 5, pp. 948, 949*).—This is a preliminary report of a study given in detail in the paper noted below.

A fermentation test for vitamin B, II, A. S. Schultz, L. Atkin, and C. N. Frey (*Jour. Amer. Chem. Soc., 59 (1937), No. 11, pp. 2457–2460, figs. 3*).—The property of vitamin B (B_1) as a fermentation accelerator is employed in the assay method described in this paper by which the increase in the yield of gas in the presence of vitamin B_1 is compared with the rate of fermentation of a control reaction mixture consisting of ammonium phosphate and dextrose, with salts of potassium, calcium, magnesium, manganese, and iron and commercial bakers' yeast. The rate of fermentation was read at 15-min. intervals on a gasometer. It is noted that the fermentation stimulation is not a specific test for vitamin B_1 and that 2-methyl-5-ethoxymethyl-6-aminopyrimidine is an interfering substance. The results should be corretated from time to time with the ultimate standard, animal growth.

The enzymic determination of ascorbic acid, M. Srinivasan (*Biochem. Jour., 31 (1937), No. 9, pp. 1524–1529*).—The author demonstrates the specificity of the Tauber and Kleiner method for the enzymic estimation of tissue ascorbic acid (E. S. R., 75, p. 588), modified by shortening the incubation period to 5 min. and carrying out the test at room temperature, by application to various sources of ascorbic acid. The presence of other indophenol-reducing impurities in addition to ascorbic acid was detected by their resistance to enzymic oxidation and to the action of mercuric acetate.

Potato starch, C. A. Brautlecht (*Maine Sta. Bul. 387 (1937), p. 243*).—This very brief statement notes that investigations have shown Maine potatoes to furnish a starch of a quality equal to that of the best imported product, the yield being about 94 percent of the starch present in potatoes of 16 percent starch content.

Cucumber pickles (*North Carolina Sta. Rpt. 1935, p. 70*).—Trials of commercial methods of manufacture are reported by I. D. Jones.

Conservation of vitamin C in tomato juice production, N. H. Sanborn (*Fruit Prod. Jour. and Amer. Vinegar Indus., 17 (1938), No. 6, pp. 164, 165*).—In a survey made in several tomato juice factories, the vitamin C content of

the raw tomato, of the juice during preparation, and of the finished product was determined. The greatest loss of Vitamin C was found to be caused by improper operation of the pumps handling the chopped tomatoes and the juice. The remedy suggested is the installation of a float valve to prevent the incorporation of air with the tomatoes. Other causes of vitamin C loss were attributed to the products being held in storage or in heating tanks, and the practice of skimming off the froth after the juice had been transferred from one tank to another. The most complete conservation of vitamin C was found in the factories using the hot break procedure, in which the raw tomatoes are mechanically chopped up and pumped through a preheater before the juice is extracted.

Campbell's book: Canning, preserving, and pickling, C. H. CAMPBELL (*New York: Vance Pub. Corp., 1937, rev. ed., pp. VIII+848, [pl. 1, figs. 116]*).—This is mainly a commercial fruit and vegetable canners' recipe book, divided into the six sections, canning, preserving, tomato products, pickling, condiments and sauces, and miscellaneous products, each containing several chapters dealing with the preparation of specific products.

Canning practice and control, O. and T. W. JONES (*London: Chapman & Hall, 1937, pp. XII+254, [pls. 65], figs. [7]*).—Defining canned food as "foodstuff hermetically sealed and processed in a metal container" and restricting their treatment to such products and their preparation, the authors cover the subject of canning technology from the choice of site and construction of buildings and equipment to bacteriological methods needed in the control laboratory and in the examination of the finished product. The contents are: Preliminary statistics, the cannery and preliminary equipment, canning, the cannery laboratory and its work, examination of raw foodstuffs, examination of the can, water supplies for the cannery, examination of canned foods, general outline of the microbiology of canning, preparation and use of culture media, staining of micro-organisms for microscopical examination, cultural notes of the principal food spoiling organisms, effect of canning upon nutritive values, cannery waste, and cannery hygiene.

Effect of temperature, variety of juice, and method of increasing sugar content on maximum alcohol production by Saccharomyces ellipsoideus, L. HOHL and W. V. CRUESS (*Food Res., 1 (1936), No. 5, pp. 405–411*).—The authors of this contribution from the University of California report upon the effect of several factors in high alcohol production by *S. ellipsoideus* with "siruped fermentation." Temperature was found to exert a very marked effect when from 20° to 22° C. was exceeded. In the range from 25° to 37° maximum alcohol production decreased progressively, and it decreased at an accelerated rate above 30°. Juices from various fruits and vegetables differed markedly in their suitability for this purpose. Grape concentrate was superior to the pure sugars for use in "siruping" the fermentation to produce high alcoholic content. Five small additions of concentrate were superior to three and to one addition.

Composition and fractionation of American steam-distilled wood turpentine, S. PALKIN, T. C. CHADWICK, and M. B. MATLACK (*U. S. Dept. Agr., Tech. Bul. 596 (1937), pp. 30, figs. 10*).—While the hydrocarbon portion constitutes by far the major part of both products, virtually all the hydrocarbon components in gum spirits consist of dicyclic terpenes, whereas the hydrocarbons in steam-distilled wood turpentine consist of appreciable proportions of monocyclic terpenes, notably dipentene (limonene), terpinene, and terpinolene. The dicyclic terpene α-pinene is present in a considerably larger proportion in steam-distilled wood turpentine than in gum spirits (80 and 60 percent). β-Pinene is present

in substantial proportions in gum spirits, but only in negligible quantities in steam-distilled wood turpentine.

"These gross differences in composition between steam-distilled wood turpentine and gum spirits, while not evident from Engler distillations and the usual routine examination of constants and properties, become manifest in a systematic fractional distillation. The pine-oil type of constituents, such as terpene alcohols, phenols, and phenolic ethers, characterizes the high-boiling portion of steam-distilled wood turpentine. With the possible exception of traces of phenols, these are absent in gum spirits. Together with the presence of benzaldehyde and monocyclic hydrocarbons in this turpentine, these constitute striking and characteristic differences between it and gum spirits."

Deterioration of paper as indicated by gas chamber tests, T. D. Jarrell, J. M. Hankins, and F. P. Veitch (*U. S. Dept. Agr., Tech. Bul. 605 (1938), pp. 22, figs. 8*).—At the Bureau of Chemistry and Soils eight 215- by 290-mm samples representing high- and low-grade current types of book and writing papers, six of which were purchased on current Government specifications, were tightly bound in a 9¼- by 11½-in. slotted lock post binder. The binder was exposed for 330 days in a chamber maintained at a relative humidity between 20 and 48 percent and a temperature of about 50° C. Gaseous sulfur products of combustion were produced in the chamber by a small constantly burning jet of illuminating gas. The binder was kept tightly closed at all times when in the chamber. At the end of 90, 180, and 330 days, leaves of each of the papers were removed from the binder and divided into various subsamples for comparative chemical and physical tests.

Under these conditions "the edges of all the papers exposed in the closed binder in the gas chamber for 330 days showed decided deterioration. The rag ledger and the highly purified wood-fiber bond papers were affected the least. These were hard-finished papers containing 2.8 and 1.8 percent, respectively, of glue, and they were among those that absorbed the least acid. After exposure . . . different sections of a given paper showed marked differences in physical condition and in chemical composition. There was a progressive increase in acidity and in degree of deterioration, as measured by folding endurance, as the distance of the subsamples from the center of the leaves increased. The sections most exposed to the polluted air were the most deteriorated. They also had the lowest pH value, the highest titratable acidity, the highest water-soluble sulfate content, the highest copper number, and the lowest α-cellulose content. The center subsamples of the papers absorbed little acid, or none. . . . With increasing acidity as indicated by pH, there was a decrease in durability, as indicated by lower folding endurance. Folding endurance, copper number, and α-cellulose content of the papers were in general agreement in indicating durability. Folding endurance, however, appeared to be more striking and more conclusive than either the copper number or α-cellulose content. . . .

"The results . . . indicate the necessity for further investigations leading to the production of book and record papers that will resist the harmful effects of sulfur acids generally present in the atmosphere, particularly in industrial localities. Addition to the paper at the time of manufacture of a material that will neutralize or counteract acidic sulfur compounds as they are absorbed should materially extend the serviceable period of valuable books and record papers."

AGRICULTURAL METEOROLOGY

Bioclimatology and agronomic research [trans. title], H. Geslin (*Ann. Agron. [Paris], n. ser., 7 (1937), No. 5, pp. 728–773, figs. 3*).—The author

reviews, with numerous references to his own studies and to the literature of the subject, relations of bioclimatics to agronomic research and how the responses are measured and interpreted. An extensive list of references to the literature of the subject is given.

Climate of the soil [trans. title], A. Demolon (*Ann. Agron.* [*Paris*], *n. ser.*, *7* (*1937*), *No. 5, pp. 625–640, figs. 3*).—The author explains in some detail, on the basis of his own observations and those of others, the climatic relations and reactions between the upper layers of the soil and the lower layers of the air in what he terms the biosphere. A considerable list of references is appended.

Report of the committee on snow, 1936–37, J. E. Church et al. (*Amer. Geophys. Union Trans.*, *18* (*1937*), *pt. 2, pp. 269–293*).—This is a report of the National Research Council's committee on snow for the period 1936–37, giving brief accounts of organization and personnel, progress of investigations in this field in the United States and other countries, and an extensive list of recent publications.

Possible research-projects in snow-surveying and stream-flow forecasting in the Western States, C. Elges (*Amer. Geophys. Union Trans.*, *18* (*1937*), *pt. 2, pp. 652–655*).—Various problems in phases of snow surveying and forecasting for which knowledge is lacking are suggested for further investigation.

Further improvement of snow-survey apparatus, J. E. Church and J. C. Marr (*Amer. Geophys. Union Trans.*, *18* (*1937*), *pt. 2, pp. 607–617, figs. 6*).—This article explains in some detail recent improvement in snow survey apparatus for increasing the accuracy of the snow measurements.

Establishing snow-courses for representativeness, permanence, and continuity of record, G. D. Clyde (*Amer. Geophys. Union Trans.*, *18* (*1937*), *pt. 2, pp. 618–631, figs. 8*).—Many years' experience in the laying out of snow courses is summarized in this article.

Review of United States Weather Bureau solar radiation investigations, I. F. Hand (*U. S. Mo. Weather Rev.*, *65* (*1937*), *No. 12, pp. 415–441, pls. 4, figs. 17*).—This article gives a summary to date of methods employed and results obtained in the solar radiation investigations of the Weather Bureau. Numerous references to literature are included and for further bibliographical details reference is made to previous literature of the Bureau (E. S. R., 24, p. 16). It is stated that "radiation from the sun is the ultimate source of all except a practically negligible portion of the continual supply of energy that is essential for the maintenance of plant and animal life on the earth and for the operation of nearly all natural phenomena on the surface of the earth; in particular, the amount and the distribution in time and space of the solar radiation which is intercepted by the earth is the primary generating cause of the physical activities in the atmosphere that determine weather and climate. The study of the radiation from the sun is therefore of direct and fundamental importance to numerous different fields of both pure and applied science, including meteorology."

Underground temperatures at Colombo Observatory, A. P. Kandasamy (*Trop. Agr.* [*Ceylon*], *89* (*1937*), *No. 4, pp. 206–208*).—Observations extending over a number of years indicate the important effect that rainfall has on underground temperatures. Temperatures commence to fall with the onset of the rainy season both in April and September, while the sharpest rise was noted in February, which at Colombo is the driest month, generally with very clear skies. It is noted that "time of day has very little effect on temperatures at 2 ft. or below. It is likely that the daily fluctuations die out even before 2 ft. is reached. It was found that the maximum of the day at 1 ft. is reached between 8 and 9 p. m., while the minimum is recorded between 10 and 11 a. m.

It was also shown that monthly means of the 9:30 a. m. and 3:30 p. m. readings could with sufficient accuracy be adopted as the monthly mean over 24 hr."

The Ohio-Mississippi floods of 1937, R. W. DAVENPORT (*Nature [London], 140 (1937), No. 3546, pp. 666–669, figs. 3*).—The flood of 1937 is compared with other large floods of the period 1858–1937, as measured at Cincinnati, Ohio, and causes contributing to the unprecedented 1937 flood and some of its characteristics are discussed.

Referring especially to the relation of the floods to topographic features, the author says: "In order to produce the characteristic topography of this valley, the Ohio in past ages must many times have occupied the flood plain in a degree similar to that of 1937. The evidence and experience seem to demonstrate that there is a place in the planning of flood control works for appropriate consideration of the recurrence of the great floods which geological evidence shows have occurred many times in the past. Such consideration would serve as a corrective against failure to realize adequately that a series of rains like that which produced the 1937 floods can recur," producing floods which it may not be practicable to prevent or control.

Monthly Weather Review, [November–December 1937] (*U. S. Mo. Weather Rev., 65 (1937), Nos. 11, pp. 385–410, pls. 10, figs. 7; 12, pp. 411–468, pls. 15, figs. 20*).—In addition to the usual detailed summaries of climatological data, solar and aerological observations, observations on weather on the Atlantic and Pacific Oceans and on rivers and floods, and bibliographical and other information, these numbers contain the following contributions:

No. 11.—Advances in International Meteorology in 1936 and 1937, by W. R. Gregg (pp. 385–387); A Curious Photographic Cloud Effect, by W. J. Humphreys, (p. 387); Comparison of Temperatures from Roof and Ground Exposures at Topeka, Kans., 1935–36, by A. D. Robb (pp. 388–392); and Disturbance in the Gulf of Mexico, November 23–26, 1937, by J. H. Gallenne (pp. 392, 393).

No. 12.—International Standard Projections for Meteorological Charts, by W. R. Gregg and I. R. Tannehill (pp. 411–415); Review of United States Weather Bureau Solar Radiation Investigations, by I. F. Hand (pp. 415–441) (see p. 14); Floods in the Sacramento Valley, Calif., December 1937, by E. H. Fletcher (pp. 441–444); Preliminary Report on Tornadoes in the United States During 1937, by J. P. Kohler (pp. 445, 446); and North Atlantic Tropical Disturbances of 1937, by W. E. Hurd (p. 446).

Meteorological observations (*Maine Sta. Bul. 387 (1937), pp. 257–260*).—The usual observations on temperature, precipitation, snowfall, sunshine, and wind at Orono for 1936 and the first six months of 1937 are summarized, and in addition corresponding data for Presque Isle, Maine.

SOILS—FERTILIZERS

[Soil investigations at the Cornell Station] (*[New York] Cornell Sta. Rpt. 1937, pp. 98–103*).—The report contains brief statements concerning the condition of nitrogen in the soil and its utilization by crop plants, the leaching of soils, the effect of liming on soils, nitrogen and sulfur in rain water, ionic exchange, pasture investigations, peat soils, forest soils, fertilizer tests of soil types, and methods of field experimentation.

[Soils and fertilizers, North Carolina Station] (*North Carolina Sta. Rpt. 1935, pp. 10–13, 17–20*).—The report details phosphate trials in cooperation with the T. V. A., by C. B. Williams and S. A. Redfearn; and on a number of soil projects by L. G. Willis and J. R. Piland, including oxidation-reduction studies;

the use of copper sulfate on peat soils, as a remedy for an excess of soluble manganese, and as a cause of iron deficiency; properties of soil organic matter; fertilizers as the cause of magnesium deficiency; neutralizing effect of organic nitrogen; relation between liming and chlorine injury to tobacco; and boron deficiency.

[Soil work by the Texas Station] (*Texas Sta. Rpt. 1936, pp. 19–22, 181–186, 206–209, 233–236*).—The report contains notes on factors of soil fertility, by G. S. Fraps; the phosphate-fixing power of soils, by Fraps, J. F. Fudge, and P. Macy; nitrification, by Fraps and A. J. Sterges; soils in relation to root rot investigations, by Fraps, Fudge, and P. F. Macy; and the relation of soil composition to plant and animal deficiencies, by Fudge; soil and water conservation, by S. J. Mech and J. B. Pope at Tyler, P. L. Hopkins at Temple, and R. E. Dickson, B. C. Langley, and C. E. Fisher at Spur.

[Soil Survey Reports, 1933 Series] (*U. S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpts.], Ser. 1933, Nos. 6, pp. 37, figs. 2, map 1; 9, pp. 44, figs. 2, map 1; 10, pp. 42, figs. 2, map. 1*).—The first of these three surveys was made with the cooperation of the Virginia Experiment Station and the others with the University of Nebraska State Soil Survey.

No. 6. *Soil survey of Southampton County, Virginia*, R. E. Devereux, E. Shulkcum, et al.—Southampton County, southeastern Virginia, covers 386,560 acres, including nearly flat sections and rolling and sloping areas broken by narrow shallow valleys. With reference to drainage conditions, it is noted that "all the main streams are sluggish," and that "extensive areas of soils, owing to their swampy condition or naturally poor drainage and heavy character, are not suitable for farming under present economic conditions but are capable of producing good timber." Soils assigned to 22 types are grouped into 13 series. Norfolk fine sandy loam takes up 43.5 percent of the county. Swamp covers a further 10.5 percent.

No. 9. *Soil survey of Boyd County, Nebraska*, W. J. Moran et al.—Boyd County occupies 342,400 acres in northeastern Nebraska and lies in the High Plains section of the Great Plains province. The county possesses an effective dendritic drainage system flowing in a generally eastward direction to the Missouri River.

Moody silt loam, a highly productive soil and the most extensive type found in Boyd County, occupies 18.6 percent of the entire area. The fine and very fine sandy loams of the same series taken together furnish a further 12.5 percent of highly productive soils. Lands best adapted for grass include 29.9 percent of rough broken land and a few types of minor extent.

The report contains a brief note on selenium poisoning and seleniferous soils.

No. 10. *Soil survey of Keya Paha County, Nebraska*, W. D. Lee at al.—This county possesses an area of 496,000 acres in northern Nebraska in the High Plains section of the Great Plains province. The soils of the county are here classified as 14 series inclusive of 24 types, Valentine sand occupying 18.5 percent. The soils suited only to grass include 15 percent of rough broken land, together with several of the more sandy types.

Soil survey of Greer County, Oklahoma, A. W. Goke and R. E. Penn (*U. S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpt.], Ser. 1932, No. 21, pp. 34, figs. 2, map 1*).—Greer County, 412,160 acres in southwestern Oklahoma, lies in the Great Plains region and has "smooth and moderately broken features of relief." In this survey, made in cooperation with the Oklahoma Experiment Station, the soils found were of 15 series and include 31 types. Hollister silt loam totals 10.3 percent, rough broken land 17.4 percent, and rough stony land 1 percent of the area surveyed. Recommendations for soil management, by H. S. Harper, which include chemical analyses are added.

Soils of the phaneropodzolic group in western Oregon, C. C. Nikiforoff (*Soil Sci., 44 (1937), No. 6, pp. 447–465, pls. 3, fig. 1*).—This is a contribution from the U. S. D. A. Bureau of Chemistry and Soils.

"All soils of the podzolic type of formation may be divided into two general groups, which may be designated as the phaneropodzolic soils and the kryptopodzolic soils. The phaneropodzolic group includes the soils characterized by a morphological profile giving a clear expression of the process of podzolization, whereas the group of kryptopodzolic soils is composed of the soils the morphological profile of which does not show the usual physical marks of podzolization and the podzolic character of which can be depicted only by chemical analysis. The development of a light ash-gray eluvial A_2 horizon may be considered the principal characteristic by which the soils of the phaneropodzolic group can be distinguished from the soils of the kryptopodzolic group. The difference in the B horizons of the two groups is less distinct and constant, although the B horizon of many of the phaneropodzolic soils is characterized by considerable compactness, whereas the same horizon of most of the kryptopodzolic soils displays no accelerated compaction."

The author discusses in some detail three different soils having a distinct morphology of the phaneropodzolic type which occur in western Oregon. "Of these three soil types the ground-water Podzols and the glei-meadow Podzols are rather local formations, whereas the gray forest soils of the eastern foothills of the Coast Range Mountains appear as the normal regional soil of this geomorphologic landscape. In western Oregon these soils form an island widely separated from the main zone of the podzolic soils. The occurrence of this island is due to a Cascadian inversion of the great soil zones on the Pacific coast and its reinversion by the Coast Range Mountains."

Physical characteristics of soils.—I, New methods of measurement, A. N. Puri (*Soil Sci., 44 (1937), No. 6, pp. 481–487, pl. 1*).—The author describes an apparatus permitting measurement of soil cohesion as the crushing strength of a hemispherical pellet formed in a mold, the pressure being applied by a flat surface pressed against the convex surface of the soil hemisphere while its flat face rests upon the pan of a spring balance; a modification of this device by means of which hardness is measured in terms of the penetration of a steel ball pressed into the surface of a sample supported upon the same balance pan; and a device for measuring erosibility by applying a jet of water of constant head to a dumbbell-shaped sample supported at its ends and determining the time required for failure of the test piece.

In 18 soils the coefficients of correlation between the three values determined were found to be as follows: Clay percentages and cohesion values 0.97, clay percentages and Brinell numbers 0.9, clay percentages and erosion times 0.64, cohesion values and Brinell numbers 0.89, cohesion values and erosion times 0.63, and Brinell numbers and erosion times 0.74.

Pore space determination as a field method, W. C. Visser (*Soil Sci., 44 (1937), No. 6, pp. 467–479, pl. 1, figs. 2*).—The instrument here described, like that of Torstensson and Eriksson (E. S. R., 77, p. 16), is based upon Boyle's law of pressure-volume relations. The instruments previously described are not deemed wholly satisfactory, in that "the open construction requires rubber tubing, a level position, and mercury, all of which are inconveniences. Several advantages would arise from the use of a glass tube, closed at the top, as a manometer. As a matter of fact, the part of the apparatus in which the soil sample is placed—'the soil chamber,' as we shall call it—may be considered as a manometer closed at the top. This means that the instrument consists of two

manometers of the same type but with different heights. Placing a soil sample in the soil chamber of the instrument and raising the pressure will produce the same effect as shortening the volume tube, for a decrease in volume by constant diameter of the tube means a shorter apparent length. This apparent length can be calculated, for it will be clear that if in the manometer part one-half of the original volume of air is occupied by water, one-half of the volume of air in the soil chamber also will be replaced. If we can measure that volume, the whole volume of the soil chamber will be known. The difference between the blank and this calculated volume is the volume of the soil sample, that is, the volume of the soil together with the water contained in it."

The constructional principles of a strongly designed instrument are indicated in a cross-section drawing and photographs of the completed device. The use of the new instrument in showing differences between the porosity of a small spot on which wheat had been attacked by foot rot (*Ophiobolus graminis*) and that of the surrounding soil bearing a sound crop, and similar differences of soil structure between soil on which rye was badly lodged and a small area in the same field on which the crop was standing, is described. As a basis for such porosity comparisons it was assumed that capillary porosity was filled with water under field conditions as well as after saturation, that "the air space after saturation is a measure of the large, noncapillary pores, [and that] pores of a somewhat smaller size are filled with air under field conditions and with water after saturation."

The measurement of surface areas of soils and soil colloids by the use of low temperature van der Waals adsorption isotherms, P. H. EMMETT, S. BRUNAUER, and K. S. LOVE (*Soil Sci., 45 (1938), No. 1, pp. 57–65, figs. 5*).—Adsorption isotherms for nitrogen and argon at −183° C. and for N_2, O_2, and CO_2 at 0° for samples of Barnes and Cecil soils (E. S. R., 74, p. 600) and two of their colloids were obtained. From these isotherms "values for the absolute as well as the relative surfaces of the soil and soil colloid samples were obtained."

A rapid method for determining the permanent wilting point and for indicating under field conditions the relation of soil moisture thereto, G. J. BOUYOUCOS (*Soil Sci., 45 (1938), No. 1, pp. 47–55, pl. 1, figs. 2*).—The author describes, from the Michigan Experiment Station, a method "based upon the fact that when the moisture content of the soil is at or above the wilting point the moisture film around the soil particles is sufficiently thick to cause the soil particles or granules to stick to one another and to the spatula when the spatula is lightly pressed against the soil mass and to lift on the spatula as a pressed soil bar. When the soil moisture, however, is below the wilting point the moisture film is too thin and discontinuous and is held by the soil with too great attraction to bring about these results. The cohesion that takes place in this test is due to the water films and not to the natural stickiness of the soil." It was necessary to dip the spatula into methyl alcohol and to shake off the excess before each test. "Around the wilting point range the aid of the alcohol film on the spatula is essential to the success of the test." The author points out that "the principle of the method is well supported by the phenomena of vapor pressure, freezing point depression, rate of evaporation, surface force, and energy changes, wherein it is shown that the curves of those phenomena undergo a pronounced change in the region of the wilting point."

The cohesion method for determining the wilting point of soils was compared with the direct method and with the dilatometer method, and was found to be "exceedingly sensitive and accurate on practically all soils investigated except very sticky clays, the sieving of which and the resultant distribution of the moisture on all the soil particles of which are very difficult."

Effects of irrigation and cropping on soil profiles (*New Mexico Sta. Rpt. 1937, pp. 51–53*).—Comparisons of cropped and irrigated with virgin unirrigated soils are noted and discussed.

Soil losses in Berrien County, E. C. SACKRIDER and G. M. GRANTHAM (*Michigan Sta. Quart. Bul., 20 (1938), No. 3, pp. 142, 143, fig. 1*).—An experiment laid out in part for visual demonstration purposes has shown that "sheet erosion is each year removing large amounts of fertile topsoil—but is removing it in thin layers, not readily observed under field conditions." The losses ranged from 152 tons per acre from Hillsdale loam on a 13.5 percent slope, cultivated up and down, to 0.9 ton per acre loss from Coloma sandy loam on a 6 percent slope cultivated across with intervening sod strips. Losses from the three soils studied when under sod cover ranged from no loss to 0.2 ton per acre. The results were recorded for the period June 1 to October 1, 1937.

Soil erosion in Ohio, G. W. CONREY, J. S. CUTLER, and A. H. PASCHALL (*Ohio Sta. Bul. 589 (1937), pp. 32, figs. 10, map 1*).—This bulletin is designed to present the extent of the erosion problem in Ohio and to point out, in a general way, the relationship of erosion to land use. A generalized erosion map of the State made in connection with a national reconnaissance erosion survey of the United States is included. The map was compiled under the direction of the U. S. D. A. Soil Conservation Service, with the cooperation of the Bureau of Chemistry and Soils and the station.

As a result of studies made in Soil Conservation Service project areas and Civilian Conservation Corps camp areas, as well as cooperative studies made by the station and the U. S. D. A. Bureau of Agricultural Economics and Soil Conservation Service, it has been established that all sloping lands in Ohio fall into four main classes where land use is concerned. These are: (1) Those lands which may be cultivated under normal tillage conditions with minimum soil loss by erosion, (2) those lands which may be cultivated if special soil-conserving measures are used, (3) those lands which should be kept permanently in grass or grass-legume cover in order to prevent erosion, and (4) those lands so steep that they should be kept under permanent shrub or tree cover if erosion is to be controlled. The slope percentages to be included in these various land-use classes vary with the soil areas.

Pasture studies.—XII, The nature of the organic phosphorus in soils, C. L. WRENSHALL and R. R. MCKIBBIN (*Canad. Jour. Res., 15 (1937), No. 11, Sect. B, pp. 475–479*).—By the use of an improved procedure for the separation of nucleic acid material from soil, as much as 65 percent of the apparent organic phosphorus in soil was separated in the nucleic acid fraction, indicating that most of the soil organic phosphorus exists in this form. Material of this nature was found to enter the soil solution. The material separated yielded, on hydrolysis, phosphoric acid, pentose sugar, adenine, and uracil, implying a mixture of mononucleotides. The presence of traces of ether-soluble phosphorus in soil was confirmed.

The relation of exchangeable cations to the "active" aluminum in soil, F. MENCHIKOVSKY and M. PUFFELES (*Soil Sci., 45 (1938), No. 1, pp. 25–28*).—The authors found that "a close relation exists between the position and valence of an absorbed cation in the Hofmeister series and the amount of active Al_2O_3 in the soil, and this results in the changing stability of the absorption complex. The state of saturation with regard to cations influences the weathering phenomena and through them the appearance of toxic Al_2O_3. . . . K and Ca salts improve the soil by decreasing the content of active Al_2O_3, whereas Li and Mg salts increase the active Al toxicity of soil. The maximum active Al_2O_3 was found in H soil."

Microbiological aspects of decomposition of clover and rye plants at different growth stages, J. L. Lockett (*Soil Sci., 44 (1937), No. 6, pp. 425–439, figs. 6*).—Observations with respect to the composition of plants used for green manuring and to their decomposition in the soil are reported from the New Jersey Experiment Stations.

The younger plants contain a larger proportion of fats and other ether- and alcohol-soluble substances, carbohydrates, proteins, and soluble ash. As the plants mature, these constituents decrease and cellulose, hemicellulose, and lignin increase.

The rate of decomposition of organic materials was found to depend upon the composition of the plant. The higher the concentration of water-soluble constituents, especially the carbohydrate and the nitrogen fractions, the more rapid was the rate of decomposition.

The moisture content most favorable for maximum decomposition appeared to be about 18 percent. Decomposition was retarded when the moisture content was as low as 9 percent or as high as 27 percent. The liberation of nitrate in the soil was depressed at a moisture content above 18 percent. Nitrate was not liberated for a period of from 21 to 28 days, or until the active period of decomposition was complete. Ammonia accumulated in greatest amounts during the early part of the active period of decomposition and remained virtually constant until the rate of decomposition decreased. The ammonia then changed into nitrate.

The abundance of soil micro-organisms (species of bacteria, *Actinomyces*, and fungi) was greatly increased by all the plant materials, the extent of the increase being determined by the nature of the organic material. The young plants increased the number of micro-organisms to a greater extent than did the mature plants. Clover produced a more abundant population than did rye. Both plate counts and direct microscopic count showed these changes. The largest number of cellulose-decomposing bacteria was observed in the soil treated with young rye, the next greatest number in that treated with young clover. No greater number of cellulose bacteria was found in the soil with mature rye than in the untreated soil. The composition of the plant material, differing with the species and stage of maturity, appeared to determine the type of micro-organisms which will participate in the decomposition process. Different groups of micro-organisms developed in response to the various materials.

Nitrogen and phosphorus changes in the decomposition of rye and clover at different stages of growth, J. L. Lockett (*Soil Sci., 45 (1938), No. 1, pp. 13–24, fig. 1*).—The author found at the New Jersey Experiment Stations that during the early period of decomposition the clover plants of all stages of maturity decomposed more rapidly than did the rye plants of the same age, but on further decomposition the young rye plants lost a greater amount of total organic matter than did the young clover. "The disappearance of hemicelluloses, celluloses, and water-soluble constituents accounts for the greater portion of the loss of the total organic matter. In the young plant compost, the lignin and protein complexes account for most of the residual organic matter, whereas hemicellulose, cellulose, and lignin account for most of the organic matter remaining in the composts of the mature plants. Mineral nitrogen was liberated from the clover plants more rapidly than from the rye plants of the same age. Ammonia was formed more rapidly from the young rye plants than from the young clover plants, but the ammonia was slowly nitrified. The rapidity with which mineral nitrogen is liberated is influenced by the chemical composition of the plants. Young plants contain a relatively large amount of nitrogen and a relatively low percentage of organic complexes. They decompose rapidly, therefore, and a large amount of mineral nitrogen is produced,

Because of rapid decomposition, nitrogen may be lost through volatilization of ammonia.

"During the process of decomposition of organic materials, inorganic phosphorus is converted into organic phosphorus through assimilation by microorganisms and is elaborated into organic cell substances. Upon further decomposition of the organic materials, the phosphorus is again liberated into the inorganic state. This appears to be associated with the disintegration of the microbial cells."

Influence of artificial irradiation upon the oxidation of ammonia and formation of nitrate in soil, S. A. Waksman, M. R. Madhok, and A. Hollaender (*Soil Sci., 44 (1937), No. 6, pp. 441–446*).—At the New Jersey Experiment Stations experiments on irradiation of soil led to the conclusion that treatment of soil with ultraviolet light brings about the destruction of some of the soil micro-organisms, including the nitrifying bacteria. "Observations of numerous workers, who have shown that the maximum germicidal activity of light is obtained from radiations having a wavelength between 2,500 and 2,800 a. u., were thus confirmed. No formation of nitrate in soil photochemically, however, could be demonstrated. In this respect, the soil behaves quite differently from sea water and liquid media."

A study of Bacterium globiforme Conn in soils differing in fertility, C. B. Taylor and A. G. Lochhead (*Canad. Jour. Res., 15 (1937), No. 7, Sect. C, pp. 340–347, pl. 1*).—Observations were made of the abundance of *B. globiforme* in three soils that had been subjected to different fertilizer treatments. It was found that the organism was as numerous in a soil of low fertility which had been cropped continuously for 25 yr. without application of fertilizer as in plats of greater crop-producing power receiving farmyard manure and artificial fertilizer. Freezing of the soil under field and artificial conditions had no significant effect on the numbers of the organism.

From the soils 110 cultures of *B. globiforme*, described by Conn (E. S. R., 60, p. 420), were isolated, and 10 strains were studied in detail. "All showed characteristic metamorphosis from rod to coccus, though variations in cell size and time rates of change were observed. The change of shape is not merely a shortening of the rod until the organism becomes spherical but involves a swelling of the rod followed by a fragmentation leaving ovoid bodies which become cocci."

As in the case of the Dunkirk fine sand examined by Conn, it was found that the organism could make good growth in a soil of low productivity, though it is naturally absent from some soils of low fertility.

Fertility value of cultivated land as influenced by crop-residue and season, B. N. and S. N. Singh and P. P. Gupta (*Soil Sci., 45 (1938), No. 1, pp. 3–12*).—Under the agricultural conditions of India "the amount of available nitrogen is highest in that stratum of the soil in which the plant feeds. Shallow-rooted legumes increase the quantity of surface nitrogen, and deep-rooted legumes exhibit the highest values in deeper layers. Fluctuations are very common in the top layers of the soil, the lowermost showing a steady and almost leveled nature. The greater the depth the less is the available nitrogen. The amount of available nitrogen in all cases is comparatively low in spring, increases in summer, and once again decreases in the rains, after which it again rises until the first of October. The decrease in its value with season is more significant with nonleguminous crops than with leguminous. The loss on ignition of the soil varies from the early period of experimentation to the onset of rains. . . . Of the leguminous crops used in a study of manurial efficiency, *Crotalaria juncea* was found to contribute the most to the nitrogen content of the soil and to the yield of the succeeding crop."

Theory and practice in the use of fertilizers, F. E. BEAR (*New York: John Wiley & Sons; London: Chapman & Hall, 1938, 2. ed., pp. IX+360, pl. 1, figs. 63*).—"This book has been written for the purpose of bringing together in one volume the various points of view concerning fertilizer practice that have been developed by the many workers in this field since the time of Liebig and of Lawes and Gilbert." The contents are: Early soil science, the nitrogen controversy, biological fixation of nitrogen, nitrification, nitrogen economy in soils, the mineral theory, ash analyses of plants, mineral constituents of the soil solution, mineral economy in soils, development of the fertilizer industry, nitrogen fertilizers, phosphoric acid fertilizers, potash fertilizers, mixed fertilizers, principles of fertilizer practice, the selection of fertilizers, the application of fertilizers, controlling the soil reaction, supplying organic matter, trace elements in soils and crops, and index.

Fertility and fertilizer practices for an improved agriculture, J. W. TIDMORE (*Com. Fert., 52 (1936), No. 4, pp. 30–33*).—Experiments by the Alabama Experiment Station for the purpose of determining the most profitable fertilizer treatment and cropping system for cotton and corn are summarized.

New developments in fertilizer use, H. H. ZIMMERLEY (*Com. Fert., 53 (1936), No. 3, pp. 11, 12, 14, 16–19, figs. 4*).—The need for non-acid-forming fertilizers and the development of such mixtures is discussed in a paper from the Virginia Truck Experiment Station, together with the minor or secondary plant food elements and rapid chemical tests for plant nutrients.

Sources of fertilizer materials, J. F. LUTZ (*North Carolina Sta. Agron. Inform. Circ. 109 (1938), pp. 8*).—Sources and combinations of the fertilizer elements for tobacco are described and discussed.

Manganese: A trace element, R. V. ALLISON (*Citrus Indus., 19 (1938), No. 1, pp. 15, 18*).—This contribution by the Florida Experiment Station gives a general summary of published work on the subject, including deficiency symptoms and their amelioration.

Inspection of commercial fertilizers, H. D. HASKINS (*Massachusetts Sta. Control Ser. Bul. 90 (1937), pp. 48*).—In addition to the usual fertilizer analysis data for 1937, this bulletin reports tests of "a low-analysis natural Florida phosphate known to the industry as 'pond phosphate,' a byproduct in mining Florida rock phosphate" offered for sale as a fertilizer in Massachusetts. It was found to contain only 2.88 percent available phosphoric anhydride out of a total of 23.14 percent.

Analyses of commercial fertilizers, J. T. SPARLING and E. BURKE (*Montana Sta. Bul. 352 (1938), pp. 8*).—This bulletin reports the results of the analyses of the 20 fertilizers found on the market in 1937 and discusses briefly the recently enacted fertilizer law of the State.

Inspection of agricultural lime products, H. D. HASKINS (*Massachusetts Sta. Control Ser. Bul. 91 (1937), pp. 9*).—This twenty-sixth report on the inspection of agricultural lime products in Massachusetts gives the composition of the various products which have been sold in the State during the year 1937. In case of the ground limestone products the mechanical analysis is also given.

AGRICULTURAL BOTANY

[Botanical work by the Cornell Station] (*[New York] Cornell Sta. Rpt. 1937, pp. 110–113*).—Historical and progress reports are given on the botanical work of the station.

Ecology of mixed prairie in west central Kansas, F. W. ALBERTSON (*Ecol. Monog., 7 (1937), No. 4, pp. 481–547, figs. 41*).—In this study by the University of Nebraska, the structure and distribution of three types (*Bulbilis-Bouteloua,*

Andropogon scoparius, and *A. furcatus* types) of mixed prairie were determined and the factors controlling the distribution ascertained. The text takes up the location, extent, and history of the area, its topography and drainage, geology, soils, general plant life conditions, general vegetational distribution, soil profiles, run-off, percolation, precipitation and soil moisture, temperature of air and soil, relative humidity, evaporation, water loss from phytometers, and details of the vegetation types. The bibliography includes 33 citations.

Foliar diagnosis: Principles and practice, W. Thomas (*Plant Physiol., 12 (1937), No. 3, pp. 571–599, figs. 7*).—Foliar diagnosis of a plant at any given instant is based on the mineral composition of a leaf from a definite rank (metabolic age) on the stem. The succession of chemical states with respect to a leaf of the same rank of a species as determined at different dates characterizes the foliar diagnosis of that species (and variety) for the particular growth season examined, analyses being based on dry material without considering the weight or number of leaves. The physiological facts on which the method is established are described, and two methods of expressing the results graphically are given, with the indications shown by each.

It is shown by these studies at the Pennsylvania Experiment Station that inherent in the concept of foliar diagnosis is the concept of (1) quantity or intensity of nutrition and (2) quality or the ratio of the dominant elements to one another. The dominant nutritive entities (nitrogen, phosphoric acid, and potash) are expressed as a unit of NPK (designated as the NPK unit), and the method of deriving it is described.

Rural Russet potato plants in experimental plats (1935) treated with the different combinations of commercial fertilizers (N, P, K, NP, NK, PK, and NPK) were examined by the method. The succession of coordinate points of the NPK unit for the fourth and fifth leaves from the base taken on July 7 and 29 and August 9 and 24 from plants on the differently treated plats are shown in triangular coordinates. "These graphs indicate (1) the course (nature) of the nutrition with respect to the NPK unit and (2) the relationship between the foliar diagnosis and the yields of tubers."

The bibliography contains 42 references.

Water absorption in the cotton plant as affected by soil and water temperatures, C. H. Arndt (*Plant Physiol., 12 (1937), No. 3, pp. 703–720*).—In experiments by the South Carolina Experiment Station, cotton plants growing in the greenhouse wilted on clear days when the root temperature was sufficiently lowered for a short time. For solution cultures this occurred at 10°–18° C., and for soil cultures (amply supplied with water) at about 17°–20°. The amount of lowering necessary for wilting varied, clearly depending on air temperature, relative humidity, and sunlight intensity. Exposure of the roots (soil or solution cultures) to 60° for 60 min. severely injured them and caused a marked reduction in water absorption. Plants in solution cultures did not wilt at 60° for 60 min. but did so at 70° for 15 min., while plants growing in soil wilted at a soil temperature of 60°. White areas appeared between the leaf veins during heat treatments at 60° or higher. Later these areas became yellow or brown, and affected leaves dropped within 12 days.

The distal parts of some of the roots in solution cultures were still capable of limited elongation after exposure to 60° for 60 min., but the new parts were abnormal. Exposure of roots to 10° for several hours caused them to lose their geotropic sensitivity, resulted in partial inhibition of apical growth, and induced an abnormal bending and distortion in any new apical growth occurring.

It is deemed apparent that root cooling induces wilting by lowering the capacity to absorb water from without and to transmit it to the conducting

channels. Possible mechanisms for these results are discussed. The slight permanent leaf injury due to cold treatments may have been due to inadequate water supply during the treatment or possibly to toxic material, but the pronounced leaf injury and death of leaf tissues following several days after heat treatment appears to have been due to injurious substances produced by the roots or perhaps in the adjacent soil. This supposition is supported by the observation that death of heat-treated roots and post-mortem changes in them were accompanied and followed by pronounced discoloration of the nonheated stem xylem.

Absorption spectra of single chloroplasts in living cells in the region from 664 mμ to 704 mμ, V. M. ALBERS and H. V. KNORR (*Plant Physiol., 12 (1937), No. 3, pp. 833–843, figs. 10*).—Using Protococcus, Spirogyra, and Zygnema as experimental plants, the results of this study "indicate that there are either other pigments present, giving absorption comparable to that due to chlorophyll *a*, or that chlorophyll *a* enters into the photochemical reactions in photosynthesis in several steps, forming reaction products having absorption bands at slightly different wavelengths. This last assumption seems more reasonable than the first, since one would expect that other pigments, having absorption comparable to that of chlorophyll *a*, would have been isolated by chemists working with the leaf pigments. These results also indicate quite definitely that the wavelength difference between the absorption band, as observed in pure chlorophyll *a* solutions and the living leaf, is not produced by the optical properties of the leaf tissue. . . . It is evident that, in a given leaf, the increased path of the light of wavelengths where the absorption of the pigments is less will result in a corresponding increase in the absorption in the tissues for these wavelengths, thus tending to smooth out the absorption curves. This might explain the fact that all observers working with the entire leaf have observed only a single broad absorption band at 680 mμ instead of several maxima."

Cell outgrowths from wounded surfaces of plants in damp atmospheres, C. D. LARUE (*Mich. Acad. Sci., Arts, and Letters, Papers, 22 (1936), pp. 123–139, figs. 2*).—The ability of numerous plants to form cell outgrowths from wounded leaves and stems in damp atmospheres was studied, and the results are tabulated and the morphology of the outgrowths is briefly treated. The Pteridophyta showed no callus formation on wounds, and monocotyledons usually showed little or none (with some notable exceptions). Sclerophyllous and succulent species, in general, tended to form periderm rather than callus. Leaves of a number of species formed adventitious roots, although not developing callus. The majority of the dicotyledonous leaves failed to form cell outgrowths. Such outgrowths were produced on leaves of *Mitchella repens* and *Coreopsis lanceolata* by heteroauxin application. Most dicotyledonous stems formed callus on wounds in some of their tissues, and those producing no callus were generally of species with a specialized type of vegetative reproduction. Callus formation in stems was usually strongest on the inside of the phloem. Usually, plants with great regenerative capacity showed the strongest callus development, but there were exceptions. It is suggested that all outgrowths involving increase in cell size (galls, intumescences, tyloses, lenticular outgrowths, "Perldrüsen," etc.) may be alike in that auxin is the immediate cause of cell enlargement. They may differ widely with respect to other factors which play important parts in their incidence and development.

Interception of rainfall by herbaceous vegetation, O. R. CLARK (*Science, 86 (1937), No. 2243, pp. 591, 592*).—The results obtained with the methods described in this study by the University of Nebraska indicate that the amount of water held upon the surfaces of the leaves and stems, and thus prevented from

reaching the soil, is very great, depending largely on the rate at which water fell and, to a certain extent, on the environal conditions, especially wind movement. So far as vegetation is concerned the water intercepted represents a loss, which over large areas becomes enormous. For example, wheat in intercepting 52 percent of 0.5 in. of water in 30 min. causes a loss of over 29 tons of water per acre.

The libriform fibers in the roots of sweet clover, Melilotus alba Desr., J. N. MARTIN (*Iowa State Col. Jour. Sci., 11 (1937), No. 4, pp. 353–363, pl. 1*).—This is a cytological and morphological study from the Iowa State College.

Vegetative anatomy of the tomato (Lycopersicum esculentum Mill.).—II, Leaf structure, E. F. WOODCOCK (*Mich. Acad. Sci., Arts, and Letters, Papers, 22 (1936), pp. 235–242, pls. 3, fig. 1*).—Continuing this series by the Michigan State College (E. S. R., 76, p. 461), the gross morphology and anatomy of the leaf are described.

Proliferation and renewal of growth in suppressed fruits in tomatoes, F. G. GUSTAFSON (*Mich. Acad. Sci., Arts, and Letters, Papers, 22 (1936), pp. 79–82, pls. 3*).—"It may . . . be considered that, when the suppressing influence of the apical growing point is eliminated by the removal of the top of the tomato plant, the growth hormones, which are produced in the leaves, activate the cambial cells in the stem at the cut surface and in the leaf axils to renewed growth; and even the parenchyma cells of the midrib of a leaf may be caused to form new cells which differentiate into shoots. With respect to fruits . . . the suppression of some of them may be thought of as due to the action of inhibiting substances produced by the developing fruits; and when the latter are matured the growth hormones bring about a renewal of growth processes in the suppressed fruits. . . . In these experimental plants it is likely that there is an overabundance of growth hormones due to absence of growing regions other than cambium, and this results in these unusual growths."

Survival of isolated tomato roots at suboptimal and supraoptimal temperatures, P. R. WHITE (*Plant Physiol., 12 (1937), No. 3, pp. 771–776, fig. 1*).—"Isolated tomato roots kept at 7°–11° C. for longer than 2 or 3 weeks without transfer die. If kept at 22° they must be transferred weekly if they are to be maintained in good condition. At 15° they will remain in good condition if transferred at intervals of 2 mo. A temperature of about 15° is thus more suitable than 8° or 22° for the maintenance of large numbers of stock cultures."

Separation from yeast of materials essential for growth of excised tomato roots, P. R. WHITE (*Plant Physiol., 12 (1937), No. 3, pp. 777–791, figs. 11*).—"Material obtainable from yeast has been shown to be essential for satisfactory growth in vitro of excised tomato roots. Optimal results were obtained with about 100 mg of yeast per liter of nutrient. Treatment of yeast with various reagents showed all of the effective material to be soluble in H_2O and 85 percent ethyl alcohol, stable in trichloroacetic acid, unstable in nitrous oxide, and insoluble in ethyl ether. At least 82 percent of the yeast material is inert, only 18 mg of an 85 percent alcohol extract per liter of nutrient being needed for optimal results. Extraction of this material with 100 percent alcohol separates it into two fractions, both of which are essential for satisfactory growth. The material insoluble in 100 percent alcohol contains considerable quantities of amino acids, and it is suggested that these may play an important role as growth-promoting substances for isolated tomato roots."

Amino acids in the nutrition of excised tomato roots, P. R. WHITE (*Plant Physiol., 12 (1937), No. 3, pp. 793–802, figs. 5*).—Data are here presented in continuation of the preceding paper indicating that the fraction soluble in 85 per-

cent alcohol but insoluble in 100 percent alcohol and ether may be replaced by a mixture of nine amino acids without reducing appreciably the growth rate. The amino acid content of this fraction appears to be entirely responsible for the growth-promoting effect, at least for isolated tomato root tips. Such a mixture contains glutamic acid, lysine, histidine, phenylalanine, leucine, isoleucine, valine, serine, and proline. All other amino acids appeared to be unessential under the experimental conditions.

Vitamin B_1 in the nutrition of excised tomato roots, P. R. WHITE (*Plant Physiol., 12 (1937), No. 3, pp. 803–811, figs. 5*).—"Experiments have shown that vitamin B_1, a probable constituent of the yeast fraction soluble in absolute alcohol, is an important and perhaps indispensable factor in the nutrition of excised tomato roots. The growth-promoting effect of vitamin B_1 is detectable only in the presence of the 'accessory salts,' which are also indispensable. While growth at a low level can be maintained apparently indefinitely in a nutrient containing only vitamin B_1, standard salts, accessory salts, and sugar, it is notably improved by the addition of a mixture of 9 amino acids."

The growth hormones found in plants, G. S. AVERY, JR. (*Ohio Jour. Sci., 37 (1937), No. 6, pp. 317–332, figs. 4*).—This first of a series of papers included in a symposium on the general subject of hormones takes up the discovery of hormones in plants, describes a method for determining the concentration of auxin in an unknown, and discusses the chemistry and occurrence of hormones in plants, their effectiveness, nomenclature, formation, storage, physiological regeneration, movement in plants, growth hormones and normal growth, tropisms, and the relation of hormones to other life processes.

Responses of plants to hormone-like substances, P. W. ZIMMERMAN (*Ohio Jour. Sci., 37 (1937), No. 6, pp. 333–348, pls. 3*).—This second paper in the symposium on hormones concerns the work at the Boyce Thompson Institute with plant hormones and chemical compounds which induce hormonelike responses. It includes a general summary and discussions of the conditions and factors affecting the response of plants to growth substances and their practical applications, including their use in plant propagation. There are 15 literature references.

Polar transport of auxin and electrical polarity in coleoptile of Avena, W. G. CLARK (*Plant Physiol., 12 (1937), No. 3, pp. 737–754, fig. 1*).—"Heteroauxin (indole-3-acetic acid) has a transport number of 0.07 and an absolute mobility of 10.5 mm per hour under unit potential gradient of 1 v per centimeter, as measured by conductance experiments. Heteroauxin is electrolytically transported in agar to the anode in an electric field. A potential gradient of 50 v per centimeter definitely influences the transport. Strictly nonpolarizable conditions are necessary in order to establish such an influence. Applied e. m. f.'s have no influence on the longitudinal transport of auxin in *Avena* coleoptiles, although these applied e. m. f.'s reverse or increase the inherent electrical polarity of the same sections. Inverted electrical polarity induced by gravity has no effect on longitudinal auxin transport in coleoptile sections. It is concluded that electrical polarity either has no cause and effect relation to the polarity of auxin transport in the *Avena* coleoptile, or that this relation is not amenable to treatment by the bioelectric methods outlined in this paper. The relation may be real but more subtle than has been revealed by the various types of electrometric measurements employed."

Growth responses of various plants to indole 3-n-propionic acid, S. GRANICK and H. W. DUNHAM (*Mich. Acad. Sci., Arts, and Letters, Papers, 22 (1936), pp. 69–78, pls. 2*).—The growth reactions obtained with indole-3-n-propionic acid applied as a 1 percent lanolin paste to various plant parts were

similar to those reported by others for heteroauxin and auxin-a in inducing enlargement of parenchyma cells, cell divisions, callus formation, cambium stimulation, and root formation. It seemed likely that the bending reactions depend on the amount of indolepropionic acid reaching the cells, their reactivity, and the tissue tensions set up by differential growth. The reactivity varied for the same cells under different conditions of temperature and light. Differences in growth responses of varieties of plants were also observed. The data, though limited to 43 genera, indicate that plants of the same family react similarly. For example, none of the Gramineae examined gave any responses and none of the 5 Leguminosae used could be induced to produce roots from the stems or petioles, although other growth responses were manifest.

Growth substances in relation to the mechanism of the action of radiation on plants, H. W. Popp and H. R. C. McIlvaine (*Jour. Agr. Res.* [*U. S.*], *55* (*1937*), *No. 12*, *pp. 931–936*).—A study was made by the Pennsylvania Experiment Station of the amounts of growth substance in turnip seedlings kept in total darkness as compared with those exposed to radiation from an unscreened mercury-vapor lamp or to this radiation as screened through Noviol O, G586A, or red-purple Corex A glasses. Irradiated plants uniformly contained less growth substance (determined by the Went method) than controls in total darkness, the shorter the wavelengths to which the plants were exposed the greater being the reduction. Although ultraviolet radiation was more effective in reducing the amount of growth substance, seedlings exposed to visible radiation alone also showed a lower amount than did the controls in darkness. Since the degree of stunting was definitely correlated with reduction in growth substance, and since the latter has been shown to exert a controlling influence on stem elongation, these results are believed to support the thesis that the stunting effects of radiation may be at least partly attributed to inactivation of growth substances.

Methods of sampling visible radiation, R. H. Wallace (*Plant Physiol.*, *12* (*1937*), *No. 3*, *pp. 647–666*, *figs. 10*).—In this study by the Connecticut State College, experiments on various physical arrangements of the sensitive surfaces of photocells were run to determine the combinations giving the best sampling of light. Of the six types of photounits tested, the two found to give the least error in sampling were a six-celled unit in which a photocell was fastened on each of the six sides of a cube and the whole enclosed beneath a spherical integrating shade of opal glass, and a one-celled unit in which one photocell was placed in the base of an integrating sphere facing up. There were no significant differences in results with the two units, but for other reasons the second may prove to be preferable.

Determination of visible radiation by exposure of the receiving unit horizontally to the sun's direct rays was not deemed suited to physiological studies, owing to the impossibility of correcting by the cosine law for lateral light and other effects. Also, the exposure of photocells to the sun's direct rays may be detrimental to them. A suggestion is made as to a method for integrating light records for various footcandle levels to enable each investigator to choose those levels significant for the particular study being made.

The influence of constant light and temperature upon the structure of the walls of cotton fibers and collenchymatous cells, D. B. Anderson and J. H. Moore (*Amer. Jour. Bot.*, *24* (*1937*), *No. 8*, *pp. 503–507*, *figs. 9*).—In this study by the U. S. D. A. Bureau of Plant Industry and the North Carolina Experiment Station, cotton was grown from seed to maturity under continuous artificial light. The fibers thus grown had no growth rings in their walls, but collenchymatous cell walls of cotton and potato plants grown under continuous

light and of potato plants grown in the dark showed the same conspicuous lamellation characteristic of such cells in field-grown plants. The environal factors controlling lamellation in cotton fibers thus do not influence the lamellation in collenchymatous cell walls of the same plant. Cotton fibers grown under continuous artificial light had a secondary wall composed of spirally wound, anastomosing, thread-like strands of cellulose indistinguishable in general structural pattern from the wall of field-grown fibers. Fibers grown under continuous light produced on drying the same convolutions and reversals characteristic of field-grown fibers. Cotton fibers grown under continuous light, and therefore without any evidence of cell-wall lamellation, had a tensile strength (measured by the Chandler bundle method) falling within the range of variation of field-grown cotton of the same variety.

Minimum intensity of artificial illumination effective in supplementing the normal photoperiod, J. P. AUSTIN (*Mich. Acad. Sci., Arts, and Letters, Papers, 22 (1936), pp. 25, 26*).—Under the experimental conditions the critical intensity (that necessary to supplement the normal photoperiod effectively) for both *Cosmos sulphureus* (a short-day plant) and *Rudbeckia bicolor superba* (a long-day plant) lay between 0.4 and 1.8 footcandles.

A precise method, with detailed calibration for the determination of absorption coefficients; the quantitative measurement of the visible and ultraviolet absorption spectra of alpha carotene, beta carotene, and lycopene, E. S. MILLER (*Plant Physiol., 12 (1937), No. 3, pp. 667–684, figs. 8*).—In this contribution by the University of Minnesota, data are presented to indicate that for carotenoid research the absorption cells must be placed behind slit No. 2 of the spectrophotoelectric apparatus described. With this precaution and with narrow spectral regions, the photo-oxidation becomes so decreased that, during measurement of an absorption curve, the total decomposition is less than the experimental error. A procedure for detailed calibration of the photoelectric apparatus is discussed, and suggestions are made for rendering it easier to obtain concordant results in different laboratories. Calibrated filters from the U. S. Bureau of Standards are deemed to be the best single test for the correctness of measurements by the apparatus. Precautions and limitations as to the use of the standards here presented for quantitative analysis and sources of errors are discussed.

The absorption coefficients in the visible and ultraviolet regions were measured in 80 percent ethanol and 20 percent ether for α-carotene, β-carotene, and lycopene. Data are presented indicating that a band at wavelength 3,400 a. u., or even an inflection, is due to traces of carotene oxidation products. Photo- or chemical oxidation or both are responsible for the absorption band at wavelength 3,650 a. u. In the ultraviolet, even at liquid air temperatures, it is impossible to obtain an accurate spectrum of lycopene.

The bearing of the results of this study on those reported by others is discussed.

Production of synthetic mycorhiza in the cultivated cranberry, H. F. BAIN (*Jour. Agr. Res. [U. S.], 55 (1937), No. 11, pp. 811–835, pls. 10*).—Mycorhizal fungi isolated from the roots of *Chamaedaphne calyculata*, *Ledum groenlandicum*, *Vaccinium canadense*, and *V. macrocarpon* failed to sporulate in culture, but were evidently specifically distinct from each other as well as from *Phoma radicis*, which is usually considered the symbiont of heath plants. All four fungi produced the "hyphal complex" type of mycorhizal infection in cranberry seedlings grown aseptically in sterilized agars of certain compositions. Infected seedlings were not measurably injured or benefited. Systemic infection could not be demonstrated either in inoculated or uninoculated

plants. It was found that root production by cranberry seedlings does not depend on the presence of mycorhizal fungi, but is markedly influenced by the composition of the nutrient substratum. The bibliography carries 37 references.

Studies on the root-nodule bacteria of wild leguminous plants in Wisconsin, O. A. BUSHNELL and W. B. SARLES (*Soil Sci., 44 (1937), No. 6, pp. 409–423*).—This contribution by the University of Wisconsin reports a study of the morphological and cultural characters of root-nodule bacteria isolated from 44 species of wild legumes in the State, and an attempted classification of the cultures and of the plants from which they were obtained into cross-inoculation groups. Ten further plant species are added to the cowpea group, six to the pea-vetch group, and one each to the *Robinia* and *Strophostyles* groups. Eleven plant species requiring further study have not yet been associated, and they may possibly belong to new and distinct cross-inoculation groups. Although the evidence presented indicates interrelationships of organisms and plants from the soybean, cowpea, and lupine groups, it is felt that the data presented by the authors and other workers are not yet sufficient to warrant their consolidation into a single group under a common name and subject to infection by a common organism.

Studies on bacterial pigmentation.—I, Historical considerations, R. D. REID (*Jour. Bact., 31 (1936), No. 2, pp. 205–210*).—This discussion of the literature (with 18 citations) is the initial contribution by the Pennsylvania State College in the series previously noted (E. S. R., 77, p. 597).

Role of molybdenum in the utilization of ammonium and nitrate nitrogen by Aspergillus niger, R. A. STEINBERG (*Jour. Agr. Res. [U. S.], 55 (1937), No. 12, pp. 891–902*).—Deficiency tests with *A. niger* in culture solutions indicated that ammonium nitrogen, nitrate nitrogen, and organic nitrogen (urea and asparagine) are equivalent in value for its nutrition. It is necessary, however, to adjust correctly the concentration of the other essential components of the nutrient solution, particularly that of Fe, Zn, Cu, Mn, and Mo. Acidity is of minor importance, being effective chiefly through its action in aiding to minimize deficiencies of these trace elements. The response of the organism to Mo is unique in that it is definitely associated with the type of nitrogen nutrition, being required to a greater degree with nitrate than with ammonium or organic nitrogen.

Though marked variations in Mo content of different lots were found to exist, striking deficiency results were obtained with many of the alkali and alkaline earth nitrates. On the basis of these facts and others reported in the literature, it is therefore considered that Mo is essential for activation of nitrate reductase in the reduction processes whereby nitrates are reduced to ammonium for synthesis of amino acid and protein. It is suggested also that biological specificity is a result of chemical specificity of an element, and presumably becomes more complete with increase in the number of reactions in which it simultaneously participates in the metabolism of the organism.

The growth of a butanol Clostridium in relation to the oxidation-reduction potential and oxygen content of the medium, G. KNAYSI and S. R. DUTKY (*Jour. Bact., 31 (1936), No. 2, pp. 137–149, figs. 4*).—This study from Cornell University indicated that in the absence of oxygen this *Clostridium* grows in a medium with a potential slightly below +0.385 v, compared to the normal hydrogen electrode. On the other hand, an oxygen pressure corresponding to a potential of about +0.300 v inhibits its growth. A theoretical discussion of the oxygen role and of the importance of potential is included.

The fermentation of xylose by the colon-aerogenes group of bacteria, H. REYNOLDS and C. H. WERKMAN (*Iowa State Col. Jour. Sci., 11 (1937), No. 4, pp. 373–378*).—This contribution from the Iowa State College deals with *Escherichia coli* and *Aerobacter indologenes*.

The streptococci, J. M. SHERMAN (*Bact. Rev., 1 (1937), No. 1, pp. 97*).—This monographic review of the genus (with an 11-page bibliography) is a contribution by Cornell University.

A modified root tip smear technic, W. L. BROWN (*Stain Technol., 12 (1937), No. 4, pp. 137, 138, fig. 1*).—In this contribution from the Texas Experiment Station, iron alum, used as a mordant, is said to make possible the use of smears on materials that otherwise do not smear satisfactorily. Chromosomes not staining well by the usual methods after storage gave satisfactory results by this modified technic.

A smear technic for demonstrating cell inclusions with characteristics of both mitochondria and bacteria, E. DEW. MILLER (*Stain Technol., 12 (1937), No. 4, pp. 139–141*).—Cytoplasmic inclusions in various types of cells were investigated by macerating or smearing, fixing, and staining by different mitochondrial technics. The results as regards granular, rod-like, filamentous, and globular forms suggested a relation between them and similar inclusions which in the past may in certain cases have been described as mitochondria. While mechanical disturbance and drying before fixing do not appear to alter the staining properties of these forms, alcohol produces somewhat variable results, depending on the material. The results obtained indicated the presence in the smears of numerous intracellular bacteria which might readily have been interpreted as mitochondria. In addition, both in smears and sections, there occur in certain cells inclusions of indeterminant nature.

Dioxan schedule for combination plant-animal tissues, W. C. WHITAKER (*Stain Technol., 12 (1937), No. 4, pp. 143, 144, figs. 2*).—In this study from the Oregon State College, dealing with the penetration of plant tissues by aphids, the author used with uniformly good results a modified dioxan schedule. By the procedure described, ribbon sections of even woody materials were obtained without disturbing the delicate proboscis and stylet structures of the aphids.

The dioxan technic, H. W. MOSSMAN (*Stain Technol., 12 (1937), No. 4, pp. 147–156*).—In this contribution from the University of Wisconsin, dioxan is recommended in place of alcohols and clearing oils in paraffin embedding and in staining sections. A provisional dioxan-iron-hematin method designed to avoid watery solutions is described in detail, and rough determinations of the solubilities of various salts and dyes in dioxan are presented. The unpublished experiences of various other workers with a variety of both plant and animal tissues are summarized, and a brief historical account of the development of the dioxan technic is included. A summary of pharmacological studies indicates that dioxan is not dangerously toxic in concentrations likely to be encountered in microscopic work. The bibliography includes 18 references.

Orseillin BB for staining fungal elements in Sartory's fluid, G. D. ALCORN and C. C. YEAGER (*Stain Technol., 12 (1937), No. 4, pp. 157, 158*).—In this contribution from the University of Idaho it is said that the process described is rapid, the details are simple, the essential features (e. g., nucleus, spore, and ascus) are made distinct, plasmolysis does not result, and ringed slides are permanent. Teased sections of fresh, dried, or preserved material, placed directly in the mounting medium to which the stain has been added, will show fine details after about 24 hr. For smaller objects (nuclei, small spores, etc.) teased specimens should be placed in the stain and held for 1–4 min. After

the excess stain has been washed out and the material has reached the desired stain reaction, clear Sartory's fluid is added and the specimen ringed.

Precision sectioning of wood, A. J. Bailey (*Stain Technol., 12 (1937), No. 4, pp. 159–166, figs. 6*).—In this contribution from the University of Minnesota, the function of different mechanisms and their role in cutting different types of tissue and the relative value of microtome knives and safety razor blades are discussed. Razor blades failed to cut precise sections, and a technic for sharpening a knife to give such sections is outlined. Various types of knife are illustrated. The procedure of sharpening and sectioning technics for critical results is explained. The mechanism of cutting in wood is apparently of the crushing and tearing type, indicating the necessity of final polishing in sharpening.

Microscopy with fluorescent light, R. Jenkins (*Stain Technol., 12 (1937), No. 4, pp. 167–173*).—The principles of fluorescent microscopy and the necessary apparatus are discussed. A lamp giving ultraviolet radiation, with filters to remove most of the visible light, is considered especially necessary. Some histological structures have a natural fluorescence and may thus be studied directly. In other cases fluorescence is induced by adding various activating substances (usually dyes) known as fluorochromes, a list of commercial preparations of which is given, together with the type of fluorescence induced by each in various histological structures.

GENETICS

Spontaneous chromatin rearrangements and the theory of the gene, R. Goldschmidt (*Natl. Acad. Sci. Proc., 23 (1937), No. 12, pp. 621–623*).—Evidence is presented from *Drosophila* to suggest that mutations are due to chromatin rearrangement within the chromosome rather than to gene changes. This idea is presented in substitution for the gene idea in genetics.

The theory of the gene, R. Goldschmidt (*Sci. Mo., 46 (1938), No. 3, pp. 268–273*).—A further discussion of the suggestion noted above.

Cytological studies in cotton.—IV, Chromosome conjugation in interspecific hybrids, A. Skovsted (*Jour. Genet., 34 (1937), No. 1, pp. 97–134, pls. 3, figs. 27; also Mem. Cotton Res. Sta., Trinidad, Ser. A, Genet., No. 14 (1937), pp. 97–134, pls. 3, figs. 27*).—New species hybrids recorded in the fourth number in this series (E. S. R., 74, p. 182) were *Gossypium armourianum* × *G. aridum* and *G. armourianum* × *G. trilobum*, both partly fertile, *G. sturtii* × *G. armourianum*, *G. anomalum* × *G. trilobum*, and New World cottons × *G. anomalum*. Chromosome conjugation was studied in these hybrids and in those described earlier.

The subdivision of *Gossypium* in the three cytological groups was confirmed: (1) Species with $2n=26$ from America and the neighboring Pacific Islands; (2) species with $2n=26$ from Africa, Asia, and Australia; and (3) New World cottons with $2n=52$ from America and islands in the Pacific Ocean. Hybrids within each group were characterized by almost normal chromosome conjugation compared with hybrids between groups. Combinations between groups (1) and (2) showed variable but incomplete conjugation. All hybrids between groups (3) and (1) showed similar chromosome conjugation close to 13 univalents + 13 bivalents. Combinations between groups (3) and (2) varied considerably. The number of conjugated chromosomes ranged from an average of 0.55 bivalents in New World cottons × *G. stocksii*, 2.6 in New World cottons × *G. anomalum*, and from 3.1 to 7.6 in New World cottons × *G. sturtii*, while in hybrid Asiatic cottons × New World cottons numerical chromo-

some configurations were similar to those in hybrids between groups (3) and (1).

The inference was that *Gossypium* is probably of monophyletic origin, but an early geographical separation took place into groups (1) and (2), which developed independently in different directions and finally lost most of their chromosome homology. The origin of group (3) New World cottons with $2n=52$ is discussed, and further evidence supporting the hypothesis of an origin from a hybrid between Asiatic cottons and an American wild species is advanced.

Certain triangular hybrids deviating cytologically from expectation are explained as the result of quantitative difference in chromosome homology. The average chiasma frequencies per bivalent showed positive correlation with the intensity of chromosome conjugation. Secondary pairing in American wild species indicated that 6 is the basic chromosome number. Conformity was shown in chromosome numbers and geographical distribution between *Gossypium* and the allied types *Gossypioides* and *Kokia*.

Inheritance of resistance to mildew, Erysiphe graminis hordei, in a cross of Goldfoil and Atlas barleys, F. N. Briggs and G. L. Barry (*Ztschr. Züch., Reihe A, Pflanzenzücht., 22 (1937), No. 1, pp. 75–80*).—The results of this study from the College of Agriculture, Davis, Calif., indicated that Goldfoil differs from Atlas barley in one major factor for resistance to this powdery mildew, and that resistance is incompletely dominant. Susceptible plants segregated out of the cross between Goldfoil and Hanna, indicating that the factor for mildew resistance in the former differs from that in the latter variety, these factors being designated as *GG* and *HH*, respectively. There was no indication of linkage between the mildew reaction and one factor pair each belonging to linkage groups 1 and 2, respectively.

Genetics of resistance to bacterial wilt in maize, E. J. Wellhausen (*Iowa Sta. Res. Bul. 224 (1937), pp. 69–114, figs. 18*).—The mode of inheritance of resistance to *Phytomonas stewarti*[i] (=*Bacterium stewarti*) was tested in highly stable inbred lines of corn, and except for certain tests of F_2 and backcross progeny a single highly virulent strain of bacteria was used. In general, the crosses between inbreds differing in resistance were about equal in resistance to the more resistant parent. The inheritance studies were confined chiefly to analyses of the later generation progenies of two crosses: OSF, a very resistant inbred of dent corn, × WF, a very susceptible inbred of flint corn, and OSF × W–134, a very susceptible inbred of early yellow sweet corn. Tests of the F_1 progeny indicated dominance of resistance to be fairly complete. Backcross progeny (F_1 × susceptible) of both crosses was readily divided into four equal groups: Very resistant, moderately so, susceptible, and very susceptible. It was assumed that these differences in resistance were due to independent segregation of two supplementary factors, Sw_1 and Sw_2, completely dominant over their recessive alleles, sw_1 and sw_2, respectively. Thus the very resistant genotypes contain both Sw_1 and Sw_2, moderately resistant ones only Sw_1, susceptible ones Sw_2 alone, while very susceptible genotypes are doubly recessive. In certain backcross tests under different environments it became evident that each of the four groups was not a homogeneous lot, indicating the involvement of a third minor supplementary factor, Sw_3. The data indicated that this factor, when alone, produces a resistance only slightly higher than that of the triple recessive types, and when in combination with either or both Sw_1 or Sw_2 modifies their expression by slightly increasing resistance.

From the results as a whole, it was concluded that at least three (two major and one minor) dominant, independently inherited, supplementary

factors are involved in the inheritance of resistance to bacterial wilt. The presence of all three factors either in heterozygous or homozygous dominant conditions results in a high degree of resistance, while the triple recessive condition results in a high degree of susceptibility. The intermediates between these extremes may be explained by the presence of only one dominant factor or the different possible combinations of any two.

The parental combinations, red cob and resistance and white cob and susceptibility, were more frequent in the backcross and F_2 progeny than the nonparental, thus signifying that one of the factors for resistance is genetically linked with the P-gene for cob color. The frequency of the nonparental types indicated that the linkage is not very close. The parental combinations, late maturity and resistance and early maturity and susceptibility, tended to remain together in the later generation progenies. This might be attributed to genetic linkage, though it is possible that certain factors for early maturity may also modify resistance. Endosperm characters (e. g., yellow or white color and starchy or sugary texture) seemed to assort independently of resistance.

The transgressive inheritance of reaction to flag smut, earliness of heading, partial sterility, and stiffness of glumes in a varietal cross of wheat, T. H. Shen, S. E. Tai, and S. C. Chang (*Jour. Amer. Soc. Agron., 30 (1938), No. 1, pp. 68–79*).—A genetic study was made of the F_1, F_2, F_3, and F_4 progenies of a cross between a Chinese variety and Nebawa wheat (*Triticum vulgare*), both parents free from flag smut (*Urocystis tritici*), and being medium late, easy threshing, and fully fertile varieties. The F_2, F_3, and F_4 progenies gave a small percentage of susceptible plants, and the genes for flag smut reaction appeared to be of multiple nature.

"A part of the population in F_2 headed earlier but none later than either parent. In F_3 several progenies headed significantly earlier than the early parent 4592, and a few plants in F_3 headed slightly later than the late parent, Nebawa. The genes responsible for earliness of heading seem to be multiple in nature, and the early genes are partially dominant over the late genes.

"Some plants in F_2 and F_3 had stiff glumes and some were partially sterile. Transgressive inheritance of the first three pairs of characters was obtained. This is a good example of a geographically distant cross giving transgressive inheritance. The authors have obtained a similar case of transgressive inheritance in earliness from a cross between Prelude, an American variety, and Nanking 2905, a Chinese improved strain by head selection from a native variety. . . . Accumulation of such cases may reveal the origin of hereditary variations. Crosses of polyploid varieties may give better chances for obtaining transgressive inheritance than crosses between diploids. The segregation of partial sterile plants resulted from chromosomal aberration."

Reaction of F_3 progenies of an Oro × Turkey-Florence cross to two physiologic races of Tilletia tritici and one of T. levis, O. A. Vogel and C. S. Holton (*Jour. Amer. Soc. Agron., 30 (1938), No. 1, pp. 55–59*).—Of the original parents used in this work by the Washington Experiment Station, Oro is susceptible to *T. levis* race L–8, Turkey-Florence to *T. tritici* race T–11, and both parents slightly so to *T. tritici* race T–8. The results obtained led to the conclusion that the factors for resistance to all three races apparently have been combined in some progenies, and those for susceptibility in others. Selections from one of the progenies continued to be very resistant to all three bunt races as well as to a composite of other races in the F_4 and to all of the 19 individual races in the F_5 generation. Selections from this progeny also

appeared to possess many of the desirable agronomic qualities of both parents. All progenies resistant to both L-8 and T-11 proved equally resistant to T-8.

Inheritance and correlation of shape, size, and color in the watermelon, *Citrullus vulgaris* Schrad., L. M. WEETMAN (*Iowa Sta. Res. Bul. 228 (1937), pp. 221-256, figs. 24*).—Using varieties of sharply contrasting size, shape, rind color, and seed characteristics, studies were made of the inheritance of a number of characters. The difference between elongate and spherical fruits was determined by a single pair of genes which lacked dominance. The heterozygotes bore fruits intermediate in shape. The shape of young ovaries was inherited in the same manner as that of the fruits, with a high correlation between shape of the young ovaries and the mature fruits. There was noted a highly significant negative correlation of fruit shape with fruit weight.

Apparently one major gene determines largely small size of seed in contrast to large size in the cross of Long Iowa Belle × Japan 4. The presence of a peripheral black band on the seed coat was apparently a dominant character, reddish brown was dominant to light tan, and the combination of genes for reddish brown and black bands gave black over the entire seed coat. Dark-green rind was dominant to light-green rind and was determined by one gene, although other genes apparently determined minor variations of the light color. The type of broad striping found in China 23 seemed to be due to a single recessive factor when crossed with dark-green Iowa Belle but was dominant when crossed with the light-colored Japan 6. Apparently, the striping gene either forms a multiple-allelomorphic series with the genes for dark- and light-green rind color or is very closely linked with these genes. The rind marking of Iowa Belle was highly correlated with length, width, and weight of the fruits in the cross of Iowa Belle × Japan 6, thus indicating that a size gene may be linked with the color factor. The fact that size and shape are also correlated, while the Iowa Belle marking is not linked with shape, suggests two genes for size carried on different chromosomes.

[Investigations in animal breeding in the Bureau of Animal Industry] (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt., 1937, pp. 3, 7, 8, 10, 11, 13-15, 17-19, 20, 21, 22*).—Brief reports are given on the results of investigations pertaining to variations in body weight of inbred lines of guinea pigs; inherited eye defects in guinea pigs (see p. 35); inheritance of intelligence, temperament, and other characteristics in various crosses between breeds of dogs; relation of measurements to performance in beef cattle; crossbreeding Brahman and Africander with Angus cattle, in cooperation with the Louisiana Experiment Station; feed lot performance of progeny of Hereford sires, in cooperation with the Montana Experiment Station; development of polled, uniform-colored cattle adapted to local range, in cooperation with the Florida Experiment Station; crossbreeding of Suffolk and Hampshire rams with Rambouillet and Corriedale ewes for mutton quality; the development of superior wool and mutton characteristics in Hampshire, Shropshire, and Southdale sheep; crossbreeding of Columbia and native sheep for wool and mutton production, in cooperation with the Florida Experiment Station; inheritance of fur qualities in Karakul, Karakul × Corriedale, and Karakul × Blackfaced Highland sheep; correlation between conformation at early ages and later ages in sheep; studies of the pork-producing qualities and efficiency of Danish Landrace, Danish Yorkshire, and crosses and backcrosses with Poland China, Duroc Jersey, Hampshire, and Chester White pigs, in cooperation with the Montana Experiment Station; studies of physiology of reproduction in swine, in cooperation with the Missouri Experiment Station; horse and mule breeding; and heritability of eggshell strength and texture, percentage of thick albumen, crossing poultry breeds, and sex determination at hatching in Rhode Island Red chicks.

A statistical inquiry into the inheritance of milk yield in three herds of Dairy Shorthorn cattle, A. D. BUCHANAN SMITH (*Jour. Dairy Res. [London], 8 (1937), No. 3, pp. 347–368, fig. 1*).—An analysis was made at the Institute of Animal Genetics, Edinburgh, Scotland, of the variance in milk yields between pairs of cows grouped according to relationship from three large Dairy Shorthorn herds. In general, the squared difference between the average production records increased as the relationship was reduced, as was observed in Ayrshires.[1] There was suggestion of sex linkage in the inheritance of milk yield from the much greater average squared deviation between half cousins having the same paternal grandsire than between other half cousins with the same maternal grandsire or the same paternal or maternal grandams. However, when considered by herds, the largest herd in the analysis did not show this difference even when analyzed according to high and low producers. The uncertainty is discussed, and it is concluded that definite, planned experimentation is needed to solve the problem, notwithstanding the value of suggestions that may be obtained from statistical studies of this type.

Another experiment on long range paternity in sheep, C. E. TERRILL and E. M. GILDOW (*Jour. Heredity, 29 (1938), No. 2, pp. 77, 78*).—An account is given of the artificial insemination of ewes at the Idaho Experiment Station with semen collected from the vaginas of ewes after breeding at the U. S. Sheep Experiment Station, Dubois, Idaho. Eight ewes were inseminated near the onset of oestrus, 10 during the first half, 4 during the second half, and 6 after oestrus. The sperm samples were kept from 22 to 50.5 hr. after collection. Two ewes inseminated during the last half of oestrus and 1 inseminated near the end of oestrus produced lambs. Under conditions of natural fertilization a much larger percentage of the ewes became pregnant, although in the artificial insemination trials approximately 50 percent of the spermatozoa were motile at the time of insemination.

Bulldog-jaw and parrot-mouth defects of sheep, G. W. MUIR, A. DEAKIN, A. A. MACMILLAN, and S. G. FREEBORN (*Canada Dept. Agr. Pub. 588 (1937), pp. 7, figs. 2*).—Description of these abnormalities and suggestions for ridding the flock of them when they prove to be hereditary are presented.

A double monster pig—Thoracopagus disymmetros, W. J. BAUMGARTNER and B. EVERHAM (*Kans. Acad. Sci. Trans., 39 (1936), pp. 251–255, figs. 4*).—A detailed description of two male embryos joined by union from the base of the neck to the umbilical cord.

A hereditary eye defect in guinea pigs, O. N. EATON (*Jour. Heredity, 28 (1937), No. 10, pp. 353–358, figs. 2*).—The U. S. D. A. Bureau of Animal Industry described an eye defect involving an eyeless or microphthalmic condition in one or both eyes occurring in 26.1 percent of the descendants of a single mating produced in five generations. The ratio of normal, defective, and eyeless progeny from different matings was close to expectation for a two-factor case in which one recessive factor caused defective eyes, with another recessive factor causing the eyeless condition. Exceptions were the production of a few normals from matings of defective and eyeless animals. The eye condition was associated with a high mortality.

Two independent mutations of the hooded or piebald gene of the rat and a study of the pattern modifiers, M. R. CURTIS and W. F. DUNNING (*Jour. Heredity, 28 (1937), No. 11, pp. 383–390, figs. 3*).—Two mutations of the gene *h* (hooded) to its dominant allel *h'* (Irish) occurred in unrelated inbred hooded

[1] 9. Internatl. Dairy Cong., Köbenhavn (Copenhagen), 1931, 1. Sect., Conf. Papers, Eng. ed., pp. 127–140.

lines of rats. One, a male, proved sterile, but the other, a female, had sufficient descendants in several generations to establish her genetic constitution as *AACCpph'h*. Variations in the percentage of pigmented areas of different genotypes and the progeny of parents of different genotypes are presented graphically and furnish evidence of the operation of factors modifying the extent of the hooded pattern. Difficulty in establishing a homozygous self stock suggested linkage of a lethal factor with the *H* gene.

Effect of heredity on interior egg quality and shell composition, S. S. MUNRO (*Poultry Sci., 17 (1938), No. 1, pp. 17–27*).—An analysis of the variance in the percentage of firm white, condition of firm white, yolk weight, yolk color, breaking strength of the vitelline membrane, percentage of ash of the dry shell, and percentage of ash of the total egg of eggs laid during three periods of 4 weeks each by 180 Barred Plymouth Rock pullets showed that these characters were markedly a function of the individuality of the hen. Evidence pointed toward the action of a gene for calcium utilization and its deposition in the shell, but there was no correlation in different eggs from the same hen nor between the absolute amount of calcium in the shell and its percentage occurrence. The yolk weight, as well as the ash in the shell and in the total egg, furnished evidence of family differences. The mechanism for calcium deposition in the egg was thought to be controlled by genes for efficiency of utilization, modified by parathyroid activity.

A sex difference in linkage intensity of three autosomal factors in the domestic pigeon, W. F. HOLLANDER (*Genetics, 23 (1938), No. 1, pp. 24–27, fig. 1*).—Marked differences were noted in the cross-over percentages for males and females between the autosomal genes *S* (black), *C* (checker), and *o* (opal) in linkage studies with pigeons at the Wisconsin Experiment Station. For over 600 female heterozygotes the percentages of cross-overs were 15.2±2.8 between *S* and *C*, 17.9±2.4 between *S* and *o*, and 2.5±0.9 between *C* and *o*, as compared with the respective percentages of 43.6±4.9, 47.3±4.4, and 7.2±2.1 for 270 male heterozygotes. If these results are indicative of what occurs in other chromosomes, the pigeon seems to stand alone among animals with a greater amount of crossing-over in males than in females.

Emergence orders and growth rates in the juvenile plumages of the Brown Leghorn, M. JUHN (*Jour. Expt. Zool., 77 (1938), No. 3, pp. 467–489, pl. 1, figs. 5*).—Study was made of the orders of emergence of individual feathers composing certain sequences in the Brown Leghorn. The emergence of a given feather within an emergence order was found definitely correlated with the rate of growth of that feather and its pigment pattern. However, the pigmentation patterns of feathers of identical growth rates from different tracts was not necessarily the same.

Investigations of pigmentation in different colored races of rabbits [trans. title], P. NEUMANN (*Biol. Zentbl., 57 (1937), No. 9–10, pp. 522–550, figs. 5*).—Hair from different colored animals was immersed for different intervals in N/10, N/50, and N/250 solutions of KOH for different periods. The relative solubility of the yellow and black pigments from different colored rabbits is tabulated.

A cytological study of the anterior hypophysis of the guinea pig and a statistical analysis of its cell types, H. KIRKMAN (*Amer. Jour. Anat., 61 (1937), No. 2, pp. 233–287, pls. 4*).—Following a tabulation of the literature pertaining to the structure of the pituitary gland, an analysis is given of the relative numbers of the different cell types found in the anterior pituitaries of 221 male and female guinea pigs killed in various physiological conditions, including females in different stages of oestrus and pregnancy, and following gonad-

ectomy in males and females. There was a decrease in the relative number of basophiles during oestrus. The relative number of degranulated basophiles increased at the beginning and end of pregnancy. No special pregnancy cells occurred, but acidophiles were degranulated and their activity stimulated during the middle of the pregnancy period. Increased colloid was found during the latter part of pregnancy and after parturition. Gonadectomy was found to increase the number and size of the basophiles in the guinea pig as in the rat, but no special castration cells were found in the guinea pig.

Studies in sex physiology.—XVIII, On the growth of the gravid uterus in the Merino, A. P. Malan and H. H. Curson (*Onderstepoort Jour. Vet. Sci. and Anim. Indus., 8 (1937), No. 2, pp. 417–427, figs. 6*).—Continuing this series,[2] data are presented on the increase in the weight of the gravid uterus and fetus with stage of gestation as percentage of live weight in relation to the weight of the ewe. Measurements on the allantoic and amniotic sacs are also presented.

The functional activity of the right and left bovine ovary, R. P. Reece and C. W. Turner (*Jour. Dairy Sci., 21 (1938), No. 1, pp. 37–39*).—Studies at the Missouri Experiment Station led to the conclusion that "the right ovary of cattle is functionally more active than the left ovary, and this difference in functional activity accounts for the greater number of pregnancies that occur in the right uterine horn than in the left horn."

A study of the mechanism whereby coitus excites the ovulation-producing activity of the rabbit's pituitary, C. McC. Brooks (*Amer. Jour. Physiol., 121 (1938), No. 1, pp. 157–177, figs. 3*).—The removal of the sympathetic nerve connections of the pituitary in 13 female rabbits failed to prevent ovulation following coitus, and normal-sized litters were produced. Sixteen rabbits having the pituitary stalk severed, thus destroying nerve connection with the hypothalmus, mated frequently but failed to ovulate as determined by laparotomies and the fact that no young were produced. The sympathetics of 6 of the above rabbits were also removed. Ovarian follicles ripened normally in animals with the pituitary stalk completely cut, and ovulation followed the injection of pregnancy urine or Antuitrin-S. Varied results were obtained where the pituitary stalk was only partially severed. The nerve fibers found in the pituitaries of normal animals disappeared in animals with the stalks completely cut. Little if any obvious change in body weight or weight of the genital tract, ovaries, thyroids, adrenals, submaxillary glands, or blood sugars followed the severing of the pituitary stalk. Ovulation following coitus in the rabbit was thought to result from a nerve stimulation through the pituitary stalk from the hypothalmus to the anterior lobe. Cytological changes were noted in all portions of the hypophyses of animals having the pituitary stalks sectioned.

Electrical studies of ovulation in the rabbit, J. Reboul, H. Davis, and H. B. Friedgood (*Amer. Jour. Physiol., 120 (1937), No. 4, pp. 724–732, figs. 4*).—As determined by electrodes placed in the vagina and against the abdominal wall of female rabbits from 7 to 9 hr. after mating, an abrupt change was found in the electric potential at from 5 to 15 sec. after ovulation. Trauma of the peritoneum caused opposite reactions, but no change in the electric potential was evidenced following ovulation in an externalized ovary, electrically insulated except for its blood-supply.

The thecal gland and its relation to the reproductive cycle: A study of the cyclic changes in the ovary of the pocket gopher, Geomys bursarius (Shaw), H. W. Mossman (*Amer. Jour. Anat., 61 (1937), No. 2, pp. 289–319, pls. 4, figs. 2*).—A closely graded series of serially sectioned ovaries of the pocket gopher, representing animals from early oestrus through postpartum and to the

[2] Onderstepoort Jour. Vet. Sci. and Anim. Indus., 7 (1936), No. 1, pp. 261–274, figs. 14.

early stages of a second pregnancy, showed that the theca interna forms a thick layer typical of endocrine gland tissue around both ripening normal follicles and atretic follicles. This tissue degenerates rapidly after ovulation, but some of the cells give rise to interstitial cells. The follicular epithelium gives rise to the gland cells of the corpus luteum. It is suggested that the follicular hormone is probably secreted by the so-called thecal gland cells.

Accentuation of the growth effect of theelin on genital tissues of the ovariectomized mouse by arrest of mitosis with colchicine, E. Allen, G. M. Smith, and W. U. Gardner (*Amer. Jour. Anat., 61 (1937), No. 2, pp. 321–341, pls. 6*).—The growth effect of theelin on the genital tissues of ovariectomized mice was studied by arresting the dividing cells in metaphase with colchicine. The stimulating effects of theelin were confined almost entirely to the epithelial tissues of the genital organs. Growth was started with theelin prior to 9.5 hr. after a single injection and reached a maximum at 37 hr. Growth also appeared around the nipple in the primary duct and in some of the small terminal branches of the mammary gland.

Quantitative effects of theelin on body growth and endocrine glands in young albino rats, C. B. Freudenberger and F. W. Clausen (*Anat. Rec., 69 (1937), No. 2, pp. 171–177*).—Injection of 200 International Units of theelin per day into immature female rats for 5 and 10 days noticeably increased the size of the hypophysis, thyroids, and ovaries, and decreased the thymus, body weight, and tail length. The head weight, suprarenal glands, and body length were unchanged.

The effect of androgenic compounds on the histological structure of the pituitary in the castrated rat, M. Allanson (*Roy. Soc. [London] Proc., Ser. B, 124 (1937), No. 835, pp. 196–209, fig. 1*).—Almost complete correction of the pituitary was effected in castrated rats by the injection for from 10- to 20-day periods of androstenedione, testosterone, and testosterone propionate. There was little relation between the oestrogenic properties of male hormones and their power to restore the pituitary. Subcutaneous implantations of androstanediol and testosterone maintained the normal structure of the anterior pituitary for as long as 30 days.

Histological changes produced by castration and by sex hormones in the adrenals of normal and of castrated male rats, K. Hall and V. Korenchevsky (*Nature [London], 140 (1937), No. 3538, p. 318*).—The hypertrophy and cytologic changes in the adrenals of the rat following castration were almost completely corrected by injections of androsterone, androstanediol, dehydroandrosterone, testosterone, testosterone propionate, androstenediol, and androstenedione.

Factors influencing the effectiveness of administered hormones, R. Deanesly and A. S. Parkes (*Roy Soc. [London] Proc., Ser. B, 124 (1937), No. 836, pp. 279–298, pls. 4, figs. 4*).—The effectiveness of different methods of administration of male hormones was measured by the weight of the secondary sex organs of castrated rats and the capon comb test, and of female hormones by the capon plumage test and the condition of the uterus of the immature rabbit. The results showed marked differences with the several compounds employed. Some of the free hormones were increased in effectiveness when administered in dry form by the subcutaneous implantation of tablets, with their later removal, desiccation, and determination of the weight of the recovered material. Evidently, esters lose their increased effectiveness when given by intraperitoneal or intravenous injection. Prolongation of action by esterification seems due to delayed absorption.

The male sex hormone: Some factors controlling its production and some of its effects on the reproductive organs, W. O. NELSON (*Ohio Jour. Sci., 37 (1937), No. 6, pp. 378–393*).—A study was made of the weights and cell character of the seminal vesicles, prostates, and hypophyses of rats following castration or the placement of the testicle in the abdomen. Artificial cryptorchidism resulted in castration change in the hypophyses after 75 days, decrease in the size of the seminal vesicles after 240 days, and decrease in the prostate after 500 days. The administration of Antuitrin-S to cryptorchid animals restored the seminal vesicles and prostates to normal. In further tests sperm production in hypophysectomized animals was continued at least 60 days by the administration of synthetic male hormones. It thus seems unnecessary to postulate the existence of two hormones, one for spermatogenesis and one to maintain the secondary sex organs. Differences in the amount of the same hormone furnished an adequate explanation.

Hypophysectomy and its effects on male reproductive organs in a wild mammal with annual rut (Citellus), L. J. WELLS and E. T. GOMEZ (*Anat. Rec., 69 (1937), No. 2, pp. 213–227, pl. 1, figs. 2*).—In studies at the Missouri Experiment Station, hypophysectomy in male ground squirrels early in the mating season resulted in regression of the accessory reproductive organs and testes, with a lack of spermatids or spermatozoa. The removal of the hypophyses of males during the quiescent period prevented the renewed development of the testes and sperm formation which occurred in unoperated animals as the breeding season approached. Sexual development was prevented in immature males by hypophysectomy. Varying results were noted with partial removal of the pituitary.

Morphological changes in the pituitaries of rats resulting from combined thyroidectomy and gonadectomy, I. T. ZECKWER (*Amer. Jour. Path., 13 (1937), No. 6 pp. 985–992, pl. 1, fig. 1*).—Cytological study of the pituitary glands of male and female rats, thyroidectomized and gonadectomized at from 35 to 40 days of age, showed that after from 44 to 171 days a greater hypertrophy of the pituitaries had occurred than after either operation alone, and both thyroidectomy and castration cells were present in the same pituitary. Acidophiles degranulated and disappeared after both operations as after thyroidectomy alone. The thyroidectomy and castration cells were thought to produce different hormones.

The effect of progestin and progesterone on ovulation in the rabbit, A. W. MAKEPEACE, G. L. WEINSTEIN, and M. H. FRIEDMAN (*Amer. Jour. Physiol., 119 (1937), No. 3, pp. 512–516*).—Daily administration of progestin extracted from sows' corpora lutea and progesterone prevented postcoital ovulation in rabbits, and some does would not take the buck. Inhibition of ovulation did not extend more than 48 hr. after treatment stopped. A minimum pregnancy-maintaining dose of progestin did not prevent ovulation in response to a minimum ovulating dose of a gonadotropic hormone (Antuitrin-S). Inhibition of ovulation during pregnancy seems to result from action more central in the ovulation-provoking mechanism than the ovarian follicles.

Effects on ovariectomized rats of progesterone alone and in combination with the other sexual hormones, V. KORENCHEVSKY and K. HALL (*Nature [London], 140 (1937), No. 3534, p. 154*).—Injections of ovariectomized rats with progesterone alone resulted in only small increases in the uterus and vagina. The greatest progestational changes, although not equal to those of the pregnant uterus and vagina, were produced by 1γ doses of oestrone three times a week with 1,500γ doses of progesterone daily. The addition of male hormones to

the combination considerably improved general development in the uterus and vagina.

Stimulation of the corpora lutea of the rat by means of progesterone and testosterone, T. McKeown and S. Zuckerman (*Roy. Soc.* [*London*] *Proc., Ser. B, 124* (*1937*), *No. 836, pp. 362–368, pls. 3*).—Normal female rats injected with testosterone propionate and progesterone for from 9 to 11 days showed the presence of recent corpora lutea in the ovaries and progestational changes in the uterus evidenced by the production of a deciduoma in one of the rats injected with testosterone. Spayed rats injected with oestrone followed by testosterone or with testosterone alone did not show comparable endometrial changes.

The co-operative activity of testosterone propionate with Δ^5-androstenediol and with oestradiol in male rats, V. Korenchevsky and M. Dennison (*Biochem. Jour., 31* (*1937*), *No. 6, pp. 862–864*).—Continuing previous studies (E. S. R., 78, p. 182) cooperative activity between testosterone propionate and androstenediol was noted in the effects on all sex organs and the thymus of castrated male rats. The addition of oestradiol to testosterone propionate caused an increase in the weight of the seminal vesicles and adrenals, a decrease in the rate of involution of the thymus, and a gain in body weight.

Response of the pigeon crop gland to prolactin: Inhibition by oestradiol monobenzoate, S. J. Folley and P. White (*Nature* [*London*], *140* (*1937*), *No. 3542, p. 505*).—The administration of Progynon-B to pigeons treated with prolactin showed a marked inhibition of the crop gland response, amounting to 54 percent in males and 23 percent in females. It appeared that the oestrogen inhibited the prolactin response by way of the pituitary.

FIELD CROPS

Design of agronomic experiments for plots differentiated in fertility by past treatments, H. C. Forester (*Iowa Sta. Res. Bul. 226* (*1937*), *pp. 137–172*).—The present study was made to define the possible methods by which areas which have been differentially treated in past experiments might be utilized effectively in new experiments and to determine the efficiency of the various methods. Employing the yields from a field which formed a part of a rotation (corn, cotton, oats, legumes) and fertilizer experiment conducted since 1915, possible methods of design were grouped as those in which all the treatments in the new experiment could be planted on each of the original plats, and as those in which the block of the new experiment comprised a number of the original plats. Reduction of error was attempted by grouping together plats from different parts of the field on the basis of equal fertility (as indicated by the previous yield) to form the block of the new trial, and by applying a covariance treatment to blocks formed by the grouping of adjacent plats, using the results of the original trial as concomitant information.

On the average, equal fertility grouping was little better than adjacent plat grouping. Use of covariance on the adjacent plat grouping on the basis of 1 year's previous yield was twice as efficient as adjacent plat grouping alone. Multiple covariance on the basis of results of 2 previous years was over three times as efficient in reducing the error variance. The most satisfactory method of design was to ignore the previous treatments and to form the blocks from adjacent plats in the normal manner. When results are assembled at the end of the season the covariance adjustment should be used, supplying its own test as to its efficiency in reducing the error variance.

In an experiment designed so that each treatment was represented on each of the original plats, superimposed on the fertilizer trial during 1936, three top-cross varieties of corn were tested at three and four plants per hill, each of the six possible treatments being tested with normal planting as against spaced planting. Yields showed that the variety Inbred 75 on Krug gave the highest yields, that under the dry seasonal conditions of 1936 the lower rate of planting gave the higher yield, and that spaced planting gave only 0.7 bu. per acre greater yield than normal planting. Error variances, both in this trial and where covariance adjustments were applied to adjacent plat grouping, were comparable with the errors obtained from experiments placed on normal uniform sites, and very small differences between treatments were shown to be significant.

In certain of the suggested designs the interaction of the new treatments with the differential fertility of the original plats could not be separated from the error variance, and therefore such interactions might play an important part in increasing the error. Where a variety trial was superimposed on a fertilizer trial as above, evidently this interaction, although significant, will not increase the error variance unduly.

It may often be desirable to continue the original fertilizer trial because of its "permanent" nature. The bearing of the various designs on this matter is discussed, and it is shown that with certain designs the validity of the comparison of the total yields of the original plats is not disturbed by the new treatments.

Conclusions were that the covariance treatment offers a better method of using previous information than a system based on the grouping of plats from different parts of the field, and that when the information is available, much more effective use is made of the previous results when the various crop yields are treated as independent variables in a multiple covariance adjustment rather than by any system of averaging the results.

[Field crops work in Maine], R. M. Bailey, I. M. Burgess, D. S. Fink, J. A. Chucka, A. Hawkins, and B. E. Brown (*Maine Sta. Bul. 387 (1937), pp. 180, 181, 206, 207, 224–226*).—Experiments (E. S. R., 75, p. 330) again reported on briefly included fertilizer tests with potatoes involving rates of application with the usual and several other spacings, variations in formulas, variations in potash and magnesium contents, acid v. neutral fertilizers, sources of phosphorus, and uncommon elements; rate of planting tests with field beans and breeding work with snap beans; and pasture improvement by fertilization and other practices.

[Field crops experiments in New Mexico] (*New Mexico Sta. Rpt. 1937, pp. 14–27, 29, 30, 31–33, 62, 67, 68, 69, 70, 71–73, figs. 2*).—Progress is reported from field crops research (E. S. R., 77, p. 181) at the station and from outlying fields, including variety tests with winter- and spring-sown wheat and barley, corn, grain sorghum, sorgo, cotton, potatoes, sugar beets, alfalfa, soybeans, cowpeas, beans, and miscellaneous forage crops; a trial of barley and several winter legumes for green manure; breeding work with barley, cotton, and pinto beans; cultural (including planting) tests with potatoes, hegari, and sesbania; fertilizer experiments with sugar beets, cotton, and potatoes; variety, spacing, and plant bed experiments with sweetpotatoes; seed treatments with corn; irrigation tests with Acala cotton and potatoes; studies of the annual production of sugar beet seed, concerned mainly with effects of preceding crops, planting methods, and application of various fertilizers and manure; resistance to the curly top disease of sugar beets; determination of the grades and staple of New Mexico cotton; studies of the restoration of ranges by

natural and artificial revegetation and utilization of run-off water; control of Johnson grass by cultural methods, chlorates, and burning; and control of soil blowing by cultural practices and sorghum varieties. Several lines of work were in cooperation with the U. S. Department of Agriculture.

[Field crops and plant breeding research in New York] ([*New York*] *Cornell Sta. Rpt. 1937, pp. 137, 138, 170, 171*).—Accomplishments in crop improvement, especially with small grains, potatoes, hybrid corn, and cabbage, and in potato research on cultivation, variety and strain tests, storage, and effects of soil reaction are reviewed briefly; and comments are made on the scope of the research in theoretical genetics.

[Field crops work in North Carolina, 1934–35], C. B. WILLIAMS, W. H. RANKIN, C. DEARING, H. B. MANN, E. H. HOSTETLER, R. E. CURRIN, JR., J. L. REA, JR., E. G. MOSS, J. J. SKINNER, G. A. CUMMINGS, R. J. HARRIS, P. H. KIME, J. H. MOORE, R. T. STUTTS, J. B. ROBBINS, D. B. ANDERSON, G. R. SMITH, W. E. ADAMS, W. H. STEWART, JR., C. D. GRINNELS, M. E. GARDNER, and R. SCHMIDT (*North Carolina Sta. Rpt. 1935, pp. 23–29, 32–40, 41–44, 50–53, 65, 66–68*).—Research with field crops (E. S. R., 78, p. 185) again reported on from the station and substations, included variety tests with cotton, corn, wheat, oats, soybeans, red clover strains, alfalfa, potatoes, and tobacco; breeding work with cotton, tobacco, corn, wheat, oats, potatoes, and soybeans; inheritance and heterosis studies with cotton; intercropping of corn and soybeans; pasture mixtures; fertilized pastures for dairy cattle; lespedeza and kudzu as supplementary grazing crops; effects of certain dusts and sprays on growth, yield, and quality of peanuts; a study of factors which influence the size and quality of peanuts; tobacco fertilizer research concerned with fractional applications, potash sources, and needs of tobacco for sulfur, lime, chlorine, and magnesium; fertilizer experiments with cotton, involving phosphorus carriers, organic : inorganic nitrogen ratios, potash deficiency, concentrated fertilizers and methods of applying them, and placement studies; cotton fiber studies dealing with effects of source and care of seed, influence of potash deficiency "rust" upon the yield and quality of cotton, physical properties of lint of improved varieties, the value of single lock samples as a measure of seed purity in cotton, effect of erosion upon fiber and seed properties, the influence of illumination upon the structure of the cotton fiber cell wall, origin and early stages of elongation in the cotton fiber, relationship between moisture content of cotton and gin preparation, and grade and staple of North Carolina cotton; cultural needs of corn and soybeans in rotation and the form and rate of lime for corn on peat soil; fertilizer mixtures for potatoes and sweetpotatoes; the yields and quality of different field crops when grown in variously fertilized and limed rotations on several soil types; and the utilization of crops grown in rotation with cotton by two different methods. A number of lines of investigation were in cooperation with the U. S. Department of Agriculture.

[Agronomic investigations in Texas], G. S. FRAPS, P. C. MANGELSDORF, E. B. REYNOLDS, R. E. DICKSON, D. L. JONES, D. T. KILLOUGH, T. R. RICHMOND, G. T. MCNESS, R. H. WYCHE, H. M. BEACHELL, B. C. LANGLEY, C. E. FISHER, P. R. JOHNSON, H. F. MORRIS, E. K. CROUCH, R. G. REEVES, H. E. REA, H. P. SMITH, V. L. CORY, W. H. DAMERON, R. E. KARPER, J. R. QUINBY, E. S. MCFADDEN, R. L. HENSEL, J. H. JONES, J. J. TAUBENHAUS, S. D. SNYDER, J. M. ATKINS, P. B. DUNKLE, F. GAINES, J. C. STEPHENS, W. H. FRIEND, J. F. WOOD, C. H. MCDOWELL, and E. MORTENSEN (*Texas Sta. Rpt. 1936, pp. 9, 11, 29, 56–85, 107, 108, 111, 168–172, 174–177, 186–189, 190–193, 196–202, 209–215, 217–219, 220–233, 238–240, 241, 243, 244, 246–251, 257–259, 262–267, 268–271, 294, 296, 303–308, 325*).—Progress results are reported again from agronomic and plant breeding experiments

(E. S. R., 76, p. 468) at the station and substations, including varietal tests with cotton, corn, sweet corn, wheat, oats, barley, rice, grain sorghum, sorgo, sugarcane for sirup, flax, peanuts, soybeans, cowpeas, velvetbeans, alfalfa, lespedeza, clover, bur clover, sweetclover, vetch, winter peas, crotalaria, potatoes, and miscellaneous winter and summer legumes and grasses; trials of perilla and cigar wrapper tobacco; growth of spineless cactus (*Opuntia ellisiana*); breeding work with cotton, wheat, oats, barley, corn, sweet corn, rice, grain sorghum, Sudan grass, sorgo, broomcorn, cowpeas, and peanuts; development of cotton varieties adapted to mechanical harvesting; studies of the genetic and cytological relationships of corn, *Euchlaena*, and *Tripsacum*; hybrid vigor in sorghum; production of chlorophyll-deficient and mature characters by X-radiation of Texas Blackhull kafir; natural crossing in rice; anatomy and microchemistry of the cottonseed; tests of sugar beets for sucrose and purity; cultural (including planting) tests with cotton, corn, rice, grain sorghum, sorgo, Sudan grass, flax, soybeans, sweetclover, and potatoes; effect of interplanting sweetclover on yield of oats; treatment of seed potatoes and cottonseed; seedbed preparation studies; comparisons of corn and sorghums; effects of sorghum, oats, and corn on succeeding cotton and other crops; irrigation tests with alfalfa, grain sorghum, and cotton; border effect on field and nursery rice plats; studies of artificial plats for field experiments in soil improvement; fertilizer trials with crops in rotation, corn, wheat, oats, rice, potatoes, grain sorghum, alfalfa, sugarcane, and cotton; tests of sulfur earth for cotton and corn; effects of fertilizers on germination of rice seed; polyhalite as a source of potash for fertilizers; measurement of physical properties of cotton fiber; effects of weathering in the field upon characteristics of raw cotton; continuous cotton v. cotton in rotation; green manures for cotton, corn, and other crops; inoculation studies with soybeans and other legumes; germination and longevity of the seed and control of bitterweed; sulfur bricks in sidewalks to control nutgrass; rice weeds as possible hosts to the various rice diseases; control of pricklypear and pasture weeds; rice weed control with sulfuric acid solutions; cedar and mesquite eradication; production and germination of buffalo grass seed; pasture improvement and management investigations; effect of fertilizers on yield, chemical composition, and botanical composition of pasture herbage; trials of crops and seeds mixtures for summer, winter, and permanent pastures; the effect of burning on mesquite-tobosa grass pasture; management of grazing lands; combination timber and pasture production investigations; tests of small grain for pasture; soil fertility, improvement, and moisture conservation studies; strip cropping; run-off water losses in relation to crop production; and numerous crop rotations. A number of lines of work were in cooperation with the U. S. Department of Agriculture.

[Agronomic experiments in Wyoming] (*Wyoming Sta. Rpt. 1937, pp. 4–7, 10, 11, 32–36, 36–38, 39, 40, 41, 42–44, 45*).—Field crops experiments (E. S. R., 77, p. 40) at the station and substations, for which progress is reported, included variety tests with winter and spring wheat, oats, barley, rye, corn, potatoes, alfalfa, and miscellaneous forage grasses and mixtures; dry-land v. irrigated potato seed and spray experiments with potatoes; cultural (including planting) experiments with winter and spring wheat, barley, oats, corn, potatoes, sugar beets, crested wheatgrass, bromegrass, and alfalfa; fertilizer trials with alfalfa and sugar beets; crop rotations and methods of preparing seedbeds for different crops; effects of a shelter belt on increasing crop yields inside of the protected areas; residual effects of Jerusalem-artichokes on barley; trails of alfalfa in mixtures with grasses and clovers; response of grass mixtures and alfalfa to cultivation and manure; pasture studies; surveys of range vegetation;

and control of whitetop and Canada thistles. Several lines of work were cooperative with the U. S. Department of Agriculture.

Better methods of seeding meadows, L. E. THATCHER, C. J. WILLARD, and R. D. LEWIS (*Ohio Sta. Bul. 588 (1937), pp. 61, figs. 40*).—Practical information on the principles involved in seeding meadows, derived by the authors and others of the station staff from extensive experiments at the station, at Columbus, and on outlying experiment farms, deals with failure of seedings because of poor germination and earlier and later environmental and cultural hazards; and seeding technic and management concerned with the merits of companion crops and ways to handle them, effects of clipping on root reserves and systems and for weed control, rates and dates of seeding, seedbed preparations, manuring, mulching, and various cultural operations. Definite seeding practices are indicated where wheat is the companion crop for better seedings in spring-sown small grains or without a companion crop in the spring and for summer seedings. A number of seed mixtures are suggested for different situations.

High altitude studies on dry-land grasses and clovers, D. KOONCE (*Colorado Sta. Bul. 439 (1937), pp. 16, figs. 6*).—Forage yields and stands of grasses and clovers planted in pure stands and mixtures on dry land at the Fort Lewis experimental farm, 1926–35, are reported, with comments on their relative merits. The yields of dry-land forage depended largely upon moisture stored from winter snows and spring precipitation.

Bromegrass, orchard grass, and crested wheatgrass were the most promising of the grasses tested. Bromegrass increased in stand and forage throughout the test, predominated at the end, and outyielded orchard grass, which was consistent in stand and forage yield through the period. Crested wheatgrass produced good yields from pure plantings after becoming established. Yellow sweetclover, the most promising clover, did not persist throughout the test, yet produced good yields in the first few years. The mixture suggested from test results for dry-land conditions similar to those at Fort Lewis included bromegrass 10 lb., orchard grass 8, crested wheatgrass 8, and yellow sweetclover 4 lb.

Rate of seeding for barley, J. W. THAYER, JR. (*Michigan Sta. Quart. Bul., 20 (1938), No. 3, pp. 161–163*).—A briefer presentation of results noted earlier (E. S. R., 78, p. 776) from another source.

Improving the quality and yield of Michigan malting barleys, J. W. THAYER, JR. (*Michigan Sta. Quart. Bul., 20 (1938), No. 3, pp. 159–161*).—Examination of 79 malting barley samples of the 1936 crop collected from farms in different parts of the Thumb district as to color, plumpness, test weight, purity, skinned and broken kernels, and texture, factors used to determine commercial grades of malting barley, considered with comparative yields, 1934–37, of varieties at East Lansing, indicated that both quality and yield of Michigan malting barley can be improved by growing and properly handling an acceptable standard variety, such as Wisconsin No. 38. Its smooth awns make for proper shocking, its low percentage of blue kernels is desirable for the maltster, and its greater yielding ability makes it more profitable to the grower.

Influence of environmental factors on the growth of the corn plant under field conditions, H. F. EISELE (*Iowa Sta. Res. Bul. 229 (1938), pp. 257–287, figs. 5*).—The effects of environmental factors, principally available soil moisture, air temperature, evaporation, and relative humidity on the response of Reid yellow dent corn plants grown on Clarion loam under field conditions were studied during the period 1929–32, and environmental factors during each growing season were modified further by planting at rates of 1, 2, 3, 4, and 5

plants per hill. Observations on plant height, increase in leaf area, size of stalks, and dry weight of vegetative and reproductive parts have been noted earlier (E. S. R., 75, p. 335).

As a criterion for predicting corn yield, rainfall of the growing season, May to August, was found to be better than the rainfall of the entire year. Corn planted at the several rates usually had less available moisture in the thicker planting rates, especially in July and August during rainless periods. Relative humidity during the day was from 3 to 5 percent lower with 1 plant per hill than with 5 plants, but at night the relative humidity was higher in the thinner planting rates. Rate of evaporation from porous porcelain atmometer cups in cubic centimeters was 22 percent greater during July and August with 1 plant per hill than with 5 plants.

The planting rate did not influence significantly the rate of food-making per unit of leaf area as determined by increase in dry weight of leaf samples collected at 4:30 a. m. and 4 p. m. Rate of food-making was proportional to area and not to dry weight of leaf samples. A statistically significant difference was evident in the nonreducing sugars and diastase extract between leaf samples from different planting rates and in reducing and nonreducing sugars, and acid hydrolyzable material between samples collected at 4:30 a. m. and 4 p. m. According to analysis of variance, there was a significant difference in the quantity of nitrogen in kernel and cob samples attributable to date of collection; no significant difference in the quantity of nitrogen in the kernels due to rate of planting; and the quantity of nitrogen in the cob samples was slightly significant.

The 1937 Iowa corn yield test, J. L. Robinson, R. C. Eckhardt, M. M. Rhoades, and M. S. Zuber (*Iowa Sta. Bul. 370 (1938), pp. 377–436, fig. 1*).—The 1,331 entries made in the 12 fields of the 1937 Iowa corn yield test were grown cooperatively and in the same groupings as in previous years (E. S. R., 77, p. 326). The corn made excellent yields in all except two districts affected by drought, and the exceptionally favorable ripening season resulted in a small percentage of damaged kernels.

The average yield of hybrid corn was 16.4 percent more than that of open-pollinated varieties, the greatest relative increase of hybrid strains being in districts suffering most from drought. A hybrid was highest in yield in each district. The best hybrid averaged 15.85 bu. higher than the best open-pollinated variety, with a range of from 8.45 to 25.15 bu. higher among the districts.

The fact that the highest yielding entry was a regular hybrid and the lowest an experimental hybrid, and that in three districts the lowest yielding open-pollinated corns outyielded the lowest yielding regular hybrids, demonstrated that not all hybrids are good, and that the purchaser of hybrid seed should buy seed only of known and adequately tested hybrids. There was a tendency to enter hybrid combinations in those sections to which they might not be adapted in a year with a less favorable ripening season than 1937.

The highest yielding section entries in the regular open-pollinated, regular hybrid, and experimental hybrid classes, respectively, were for the northern section Rupp Early Yellow, Pioneer Hi-Bred 322, and DeKalb 464; the north central section Triple Dent, Funk Hybrid G–53, and DeKalb 600; the south central section Black Yellow Dent, Funk Hybrid 244, and Pioneer Hi-Bred 6425; and the southern section Morcorn, DeKalb 870, and Illinois Hybrid 960. Pioneer Hi-Bred 322 had the highest average percentage yield above the average open-pollinated strains of any hybrid in the northern section and excellent lodging resistance, but its moisture content somewhat exceeded the average for the section.

Two more hybrid corns prove valuable in Michigan, A. R. Marston and R. E. Decker (*Michigan Sta. Quart. Bul., 20 (1938), No. 3, pp. 156–158*).—Recent yield tests indicated Michigan Hybrid No. 1218 for grain in southern Michigan localities requiring an early maturing corn and northward to the Saginaw Valley and Thumb district, and for silage somewhat farther north; and Minnesota Hybrid No. 402 (E. S. R., 75, p. 477) for grain, silage, and fodder in all northern locations now growing corn in the lower peninsula. The merits of Michigan Hybrid No. 561 (E. S. R., 75, p. 769) indicated for grain in the more favorable soil and climatic environments of the southern tier of Michigan counties, and for silage as far north as Saginaw, have been noted earlier.

Results of cotton variety experiments, 1933–37, P. H. Kime (*North Carolina Sta. Agron. Inform. Circ. 110 (1938), pp. [2]+6*).—Cotton varietal recommendations for different areas in North Carolina on the basis of continued experiments were with few exceptions similar to those noted previously (E. S. R., 77, p. 327).

Growing potatoes, R. A. Schroeder, J. W. C. Anderson, and T. J. Talbert (*Missouri Sta. Circ. 197 (1938), pp. 22, figs. 9*).—Practical information is given on soils and crop rotations for potatoes, varieties, seed and seed treatment, fertilizers, cultivation practices, diseases and insects and their control, harvesting, storage, and grading of potatoes, all for the spring crop in Missouri. Varieties and planting dates are indicated for the fall crop.

The adaptability of strawberry clover to saline soils, C. A. Larson (*Washington Sta. Bul. 353 (1938), pp. 15, figs. 4*).—The characteristics and adaptations of strawberry clover (*Trifolium fragiferium*) are described largely from experiments and experience at the Irrigation Substation in cooperation with the U. S. Department of Agriculture.

Strawberry clover, it was found, will not make normal growth where the salt concentration is near or above the tolerance of most plants, but it can endure adverse saline conditions until more favorable growth conditions occur. Best growth is made where there is an abundance of water and the salinity is low to medium. This clover will make a profitable pasture crop on land where the subsoil water table is so high that other crop plants are largely or entirely eliminated. The amount of salinity it will tolerate without suffering in normal development is modified considerably by the primary requirement. Vigorous growth of the plant has not been observed on soils in which the K. (specific conductance value) above 200 is maintained. Strawberry clover grown on nonsaline soil had higher nitrogen and calcium contents but a lower phosphorus content than plants at the same stage of maturity grown under saline conditions.

Two new varieties of sugarcane for sirup production, B. A. Belcher and S. F. Sherwood (*U. S. Dept. Agr. Circ. 461 (1937), pp. 4*).—Extensive tests in cooperation with the Mississippi Experiment Station and in Georgia proved the superiority for sugarcane sirup production of the new disease-resistant varieties C. P. 29/116, bred by the Bureau of Plant Industry at Canal Point, Fla., and Co. 290, imported from India. Because of the desirable characteristics described, these varieties are expected to replace largely the disease-resistant varieties P. O. J. 213 and C. P. 807, recommended earlier (E. S. R., 70, p. 473). Sources of seed cane are indicated.

Tobacco cultural and fertility tests, M. A. Bachtell, R. M. Salter, and H. L. Wachter (*Ohio Sta. Bul. 590 (1938), pp. 30, figs. 7*).—Results of variety, plant bed, transplanting, cultural, harvesting, fertilizer, and rotation tests in the Miami Valley (cigar filler) tobacco district are summarized, with recommenda-

tions for growers. Earlier reports have been noted (E. S. R., 27, p. 838; 33, pp. 731, 732).

Production and time-saving practices indicated by the experiments include bagging heads of desirable plants for seed at blooming to prevent cross-pollination by insects, sprouting seed before sowing in the plant beds, growing plants in well-conditioned plant-bed soil steamed each year at 125 lb. pressure for 25 min. or 150 lb. for 20 min., setting (Ohio Hybrid 224) in the field June 15–25, suckering twice, and growing an adapted variety.

Fertility practices include the liberal use of potash and phosphorus, omission of liming (on soils only slightly acid), row application of fertilizer containing fairly liberal percentages of nitrogen, phosphorus, and potash, and side dressing with a quickly available nitrogen carrier when plants have a spread of from 6 to 8 in.

Good fertility practices have returned profits with tobacco and also from the grain and hay crops following tobacco in the rotation. Tobacco has been grown more profitably in rotation than in continuous culture and has yielded more after a legume than after corn. Wheat yielded several bushels more after tobacco than after corn.

Seed inspection in Kentucky, 1936–1937, W. A. PRICE, E. C. VAUGHN, E. DEEN, H. TILSON, J. TAYLOR, A. MARRS, K. FRIED, and M. MORTON (*Kentucky Sta. Regulat. Ser. No. 13 (1937), pp. 35*).—The germination, purity, and presence of excessive quantities of noxious weed seed are reported for 425 official samples of agricultural seed obtained during the year ended June 30, 1937.

Wild oats or downy brome: Troublesome weed on sandy land, C. R. MEGEE (*Michigan Sta. Quart. Bul., 20 (1938), No. 3, pp. 153–156*).—Downy bromegrass (*Bromus tectorum*), often called wild oats in Michigan, spreads rapidly in alfalfa fields, fence rows, and waste places, especially on sandy soil. When downy bromegrass was sown on test plats at several times during the year, seedlings started from April to June or from September to October 15 made luxuriant growth the following spring and heavy seed production, while in summer seed did not germinate and seedlings started from November 1 to January 1 made very slight growth and slight seed production. Excepting clean cultivation, there seem to be no well-established methods for controlling downy bromegrass. Several control measures used with some degree of success, but each with limitations and drawbacks, include spring grazing, use of alfalfa grass mixtures and alfalfa cutting management, cultivation before and after growth starts, early cutting of alfalfa, and fall cultivation.

HORTICULTURE

[Horticultural investigations by the Maine Station] (*Maine Sta. Bul. 387 (1937), pp. 161–171, 178–180, 201–203, 204, 243–245, 252, 253, figs. 4*).—Data obtained on the following projects are briefly noted: The relation of the size of apple trees at time of planting to subsequent development, winter injury of apple trees in relation to growth, and pollination of the apple, all by R. M. Bailey and I. M. Burgess; fall growth of apple fruits, by Bailey; apple storage studies, by Bailey and F. B. Chandler; wound dressings for winter injured apple trees, by M. T. Hilborn; growth rate and yield of apples as affected by different spray and dust materials used for scab control, by D. Folsom; sweet corn breeding, by Bailey and Burgess; sweet corn fertilization, by J. A. Chucka and S. M. Raleigh; varietal and cultural trials with vegetables, breeding tomatoes, heterosis in the tomato, and breeding cucumbers for scab resistance, all by Bailey and Burgess; boron requirements of cauliflower and re-

lated crop plants, by Chandler, Chucka, and I. C. Mason; variety tests of strawberries, raspberries, and grapes, by Bailey and Burgess; and blueberry pollination, breeding, varieties, and culture (burning and weed control), by Chandler and Mason.

[Horticultural investigations conducted by the New Mexico Station] (*New Mexico Sta. Rpt. 1937, pp. 59–61, 63–67, 68, 70, 71, 74–76, figs. 2*).—Inclnded are brief reports on phenological investigations with peaches, plums, cherries, apples, and pecans; variety trials with plums and their hybrids and with peaches, grapes, tomatoes, pecans and walnuts, small fruits, and various flowering plants; smudging for peaches and plums; varietal resistance in tomatoes to yellow western blight; resistance of head lettuce varieties to low temperature; production of vegetable seeds; culture of chia (*Salvia hispanica*); selection in the White Grano onion; and the effect of irrigation on the growth and yield of onions.

[Horticultural studies by the Cornell Station] (*[New York] Cornell Sta. Rpt. 1937, pp. 123–125, 147–153, 165–171*).—In this brief summation of 50 yr. of research there are mentioned accomplishments in various lines, such as the taxonomy and physiology of flowering plants, response of fruit trees to environmental conditions, pruning and culture, physiology and anatomy of fruit plants, behavior of fruit in storage, pollination requirements of fruit trees, taxonomy of vegetable crop plants, principles underlying the cultivation of vegetables, and the relation of temperature, light, and other factors to the growth and reproduction of vegetables.

[Horticultural investigations by the North Carolina Station] (*North Carolina Sta. Rpt. 1935, pp. 58, 59, 62–65, 70–74*) —Brief reports are presented on fertilizer and pruning studies with the peach, by C. F. Williams and M. E. Gardner; the relation of leaf area and leaf efficiency in the development of the peach, by I. D. Jones; fertilizer requirements of raspberries and strawberries, by Gardner and R. Schmidt; breeding of raspberries and dewberries, by Williams; soil conditions in relation to strawberry production, by J. J. Skinner, R. A. Lineberry, H. B. Mann, and Williams; and testing of various ornamental plants in the field and in the greenhouse, breeding of the carnation, and propagation of flowering plants and shrubs, all by G. O. Randall and J. G. Weaver.

[Horticultural investigations conducted by the Texas Station], S. H. Yarnell, J. F. Rosborough, H. F. Morris, J. C. Ratsek, W. H. Friend, E. Mortensen, J. F. Wood, H. M. Reed, R. H. Stansel, L. E. Brooks, W. S. Flory, L. R. Hawthorn, J. Whitacre, R. A. Hall, R. H. Wyche, D. L. Jones, J. J. Bayles, W. H. Dameron and H. P. Smith (*Texas Sta. Rpt. 1936, pp. 9, 10, 29–38, 172, 173, 177–179, 193, 194, 195, 196, 202, 240, 244, 245, 251–253, 254, 255, 268, 287–294, 295, 296, 297, 308–311, 312–325*).—In this customary annual report (E. S. R., 76, p. 476) there are presented the results of the following studies carried on at the main station and substations: General varietal and cultural trials with fruits, vegetables, pecans, ornamentals, and forest trees; breeding of peaches; relation of winter temperatures to successful peach culture; breeding of blackberries and related species; sterility in the blackberry; breeding and selection of citrus fruits; storage of citrus fruits; rootstocks for citrus; factors affecting the maturity of grapefruit; breeding and processing of figs; rootstocks for grapes; plum breeding; sources of sturdy pecan rootstocks; strawberry breeding; breeding of cabbage and related plants; irrigation of tomatoes; proper stage of maturity for picking tomatoes; breeding of tomatoes for resistance to summer heat and to puffing; breeding of the oleander for cold resistance; vegetative propagation of certain woody plants, including the oak and some berries; understocks for roses; and storage of cucumbers in cellophane.

[Variety trials in Wyoming] (*Wyoming Sta. Rpt. 1937, pp. 38, 44*).—At the Gillette Substation the yield of vegetables was greatly increased by irrigation. At the Torrington Substation bush fruits were seriously injured by cold, but raspberries mulched with soil produced some fruit. The Chief was the most promising raspberry. Apple and plum trees, injured by low temperature, produced little fruit.

[Horticulture at the Dominion Experimental Station, Fredericton, N. B.], C. F. Bailey (*Canada Expt. Farms, Fredericton (N. B.) Sta., Results of Expts., 1931–36, pp. 13–23, 24–27, 29, 30, figs. 5*).—Brief discussions are presented of studies on the control of corky core and bitter pit in apples, apple varieties, apple storage, apple pollination, strawberry varieties, fertilizers for tomatoes, potash deficiencies in the apple, and vegetable varieties.

Plant propagation, L. R. Bryant (*Colorado Sta. Bul. 441 (1938), pp. 29, figs. 12*).—General information is presented on the growing of plants from seed, cuttings, layers, divisions, and grafts.

Developments in insecticides and fungicides, O. J. Faloon (*Florists Exch. and Hort. Trade World, 89 (1937), No. 21, pp. 13, 16, 17*).—This is a discussion of improvement in pyrethrum and rotenone materials and of various new preparations of sulfur and copper fungicides.

Vegetable-crop production in Orleans County, New York, W. C. Barnes (*[New York] Cornell Sta. Bul. 682 (1937), pp. 23, figs. 4*).—Based on data collected on a large number of farms in different parts of the country, suggestions are presented as to the best soil types for the more important vegetable crops and the relation of factors such as climate, fertilizer, and cultural treatments to yields of various crops, including tomatoes, peas, cabbage, field beans, potatoes, and cucumbers. With tomatoes on Ontario loam, increases in the amount of commercial fertilizer gave marked responses in yield. Stable manure, on the other hand, gave only slight increases, due, perhaps, to dry weather and inopportune time of application. With late cabbage, manuring in general resulted in good increases in yield. Applications of manure to field beans gave no yield increments and only on one soil, Dunkirk gravelly loam, did commercial fertilizers benefit beans.

Southern vegetable crops, G. W. Ware (*New York: Amer. Book Co., [1937], pp. XII+467, figs. 156*).—Prepared in collaboration with leading vegetable-crop specialists throughout the country, this text presents a thoroughgoing analysis of the principles of vegetable culture, breeding, and marketing, and provides specific information on modern practices in growing and handling the various crops.

The effect of fertilizer placements and analyses on the growth and yield of certain truck crops, M. M. Parker (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 474–477, figs. 2*).—At the Virginia Truck Experiment Station, an experiment was conducted in 1936 to compare the effectiveness of increasing amounts of potash and phosphorus in fertilizer mixtures applied in various positions with relation to the seed or plants.

In the case of snap beans, where potash-containing materials were placed in wide bands beneath the seed the higher the potash content the lower was the germination and the smaller the yield. Yields obtained from side placement of materials containing 5 and 10 percent potash were slightly lower than those from broadcast applications. From greenhouse studies it was apparent that bands of fertilizer may restrict root development and interfere with soil moisture utilization during dry periods. With phosphorus, injury resulted from placement beneath the seed, but to a very slight degree with band placement along the rows. Broadcasting gave somewhat better yields than band

placement. The best yields were obtained from mixtures containing 6 percent phosphorus and 5 percent potash. Yields were low when no phosphorus was included in the mixture.

In the case of cabbage, mixing the fertilizer with the soil in the row before setting the plants gave higher yields than did the application in bands beside the row. Where fertilizer was mixed into the soil in the row, a 5 percent potash gave maximum yields, but when placed in bands 10 percent was most effective. The response to phosphorus was more marked, irrespective of the type of placement, than was the response to potash.

The extent and rate of soil moisture depletion in loess soils by asparagus and rhubarb, H. O. WERNER (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 456–461, fig. 1*).—Observations by the Nebraska Experiment Station in adjacent 15- and 6-year-old asparagus beds on a loess soil near Omaha showed the older plants to draw more heavily on the soil moisture at the lower depths. Both plantings depleted the available moisture to a very serious extent in the upper 10 ft., and the older plants were even drawing on the 15–20 ft. depth. In a rhubarb planting, down the slope and mulched with straw, the available moisture was definitely depleted to a depth of from 12 to 13 ft. A 34-year-old vineyard up the slope removed 60.3 percent of the available moisture in the upper 20 ft., and although the water usage in 1936 was as great as in the 15-year-old asparagus bed, the available water was never reduced below 13 percent of the available capacity in any one zone. Where irrigation was supplied to both asparagus plantations, the plants used more water than did the unirrigated, and did not draw on the lower depths.

Some effects of potassium on yields of snap beans, J. M. JENKINS, JR. (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 471–473*).—A reduction in yield following the application of potassic fertilizers and at first believed to be associated with root injury was found in subsequent studies by the South Carolina Truck Substation, Charleston, not to be directly related to root growth or stand of plants but rather to the deleterious effects of too abundant potash. No significant differences in yield were observed between 0 and 50 lb. of available potash, but both 70 and 100 lb. did reduce yields. There were no significant differences in yields as related to the kind of potash used when placed in bands at each side of the bean row at the time of planting, but, when mixed in the soil of the row prior to planting, kainite resulted in lower yields than did other forms. The author believes that there is ample potash for beans in most soils of the Charleston area despite the fact that the average crop of snap beans must remove from 16 to 20 lb. of the available potash.

Celery production in Michigan (*Michigan Sta. Circ. 165 (1938), pp. 48, figs. 9*).—In this discussion of the most acceptable and recommended methods for the commercial production of celery on the muck soils of Michigan, the information relating to plant production, varieties, and cultural practices is contributed by C. H. Mahoney; soils and fertilizers, by P. M. Harmer; disease control, by R. Nelson; and insect control, by R. Hutson.

Cultural experiments with yellow Bermuda onions under irrigation, L. R. HAWTHORN (*Texas Sta. Bul. 561 (1938), pp. 30, figs. 4*).—Having observed that medium-sized plants are more dependable for transplanting than larger ones because of the general tendency for the latter to produce too many doubles and seeders, it was found that the rate of seeding had a decided influence on the percentage of desirable plants. Up to 20 lb. of seed per acre, the medium-sized plants constituted from 45 to 50 percent of the crop, but above 20 lb. of seed the percentage of small plants increased rapidly. The number of acres which could be set from one acre of seedbed, with plants of all sizes used, increased

with the amount of seed sown. Under irrigation, direct field seeding rarely gave as high or as profitable yields as did transplanting. Spacings between rows of 14 in. gave usually higher yields than did 18 in. When irrigation immediately followed transplanting, yields were usually decidedly higher than where irrigation was delayed 10 days or more. Too much irrigation often reduced yields, but increased frequency following the commencement of bulbing increased yields decidedly.

The placing of a 4-in. band of fertilizer in a shallow furrow below the ridges in which the onions are placed resulted in higher yields in each of 3 yr. than the same amount of fertilizer broadcast.

Production of parsnips, J. H. and W. R. BEATTIE (*U. S. Dept. Agr. Leaflet 154 (1938), pp. 4, fig. 1*).—Herein is presented general cultural and incidental information.

Production of salsify or vegetable-oyster, W. R. BEATTIE (*U. S. Dept. Agr. Leaflet 135 (1938), pp. 2*).—This contains brief cultural and marketing suggestions.

Southern-grown vs. locally grown tomato plants, H. L. SEATON and M. C. STRONG (*Michigan Sta. Quart. Bul., 20 (1938), No. 3, pp. 131–141, figs. 4*).—Based on two seasons' work, home-grown tomato plants proved more satisfactory than southern-grown plants with respect to growth, survival, yield, and freedom from disease. The practical difficulty of producing sufficient home-grown plants for the canning crop producers is pointed out. The slow recovery of the southern-grown plants following setting in the field was a serious factor in the short growing period available for the tomato in Michigan. Increased yields more than offset the greater initial cost of the local plants.

The commercialization of hybrid vigour in the tomato, C. M. DRIVER (*New Zeal. Jour. Agr., 55 (1937), No. 6, pp. 352–364, figs. 5*).—Of 29 crosses made among 7 varieties of tomatoes reasonably distinct in type, 27 yielded first-generation hybrids which were more productive than either parent. Of the hybrids, 17 were earlier in maturity than either parent, 11 were intermediate, and 1 was later. The last resulted from a cross between 2 very similar early maturing varieties. The yield increases were sufficient to warrant the use of F_1 seed by growers, and because of the long life of tomato seed and its natural abundance in the fruit, sufficient hybrid seed could be produced in a single season to last for several years.

Some nutritional requirements of the tomato, V. A. TIEDJENS (*N. J. State Hort. Soc. News, 18 (1937), No. 6, pp. 950, 951*).—In this brief discussion of the nutrient needs of the tomato the author points out that lime is a necessary plant food. In trials conducted by the New Jersey Experiment Stations over a period of 3 yr., increases of from 3 to 4 tons of fruit per acre were obtained from applications of lime as compared with similar treatments without lime. Magnesium limestone increased the yields more than did high calcium limestone. However, where lime is used, potash may become deficient because with increased growth the plants use more potash. Where the soil shows low magnesium the high magnesium limestone should be chosen.

Organic matter experiments conducted over two seasons showed that where cover crops were grown the preceding year the yield of tomatoes was increased by as much as 4 tons per acre.

Effect of environmental factors upon the color of the tomato and the watermelon, A. C. VOGELE (*Plant Physiol., 12 (1937), No. 4, pp. 929–955, figs. 17*).—At the University of Minnesota, the optimum temperature for lycopene formation in the tomato was found to be 24° C. (75° F.). No lycopene was formed above 30°. Chlorophyll decomposition in tomato fruits was prevented

by temperatures of 40° or higher. In the watermelon a shift in temperature from 20° to 37° did not check the development of red pigment, indicating a different mechanism for lycopene formation than in the tomato. Color changes were apparently not the result of a single enzymatic factor, but the result of a subtle balance of conditions occurring in the active metabolic cells. In the presence of suitable temperatures, ethylene hastens chlorophyll decomposition and lycopene formation in the tomato. A decrease in oxygen supply prevented lycopene formation, but not chlorophyll decomposition at suitable temperatures. Light hastened chlorophyll decomposition, whereas lycopene formation proceeded equally well either in light or in darkness.

Minnesota Fruit Breeding Farm: New fruits described, W. H. Alderman and F. E. Haralson (*Minn. Hort., 66 (1938), No. 1, pp. 4, 5, 7*).—Included in this annual report for 1937 are descriptions of promising new seedlings, trees, and small fruits.

Fruit varieties for West Virginia, R. S. Marsh and W. H. Childs (*West Virginia Sta. Circ. 75 (1938), pp. 20*).—Based on trials by the station and on observations in commercial plantings, lists and comments are presented of apples, peaches, cherries, pears, plums, and small fruits of proven adaptation to the State.

Top and double working, and bridge grafting of fruit trees, T. J. Talbert (*Missouri Sta. Circ. 196 (1938), pp. 16, figs. 12*).—Discussing briefly the principles and practices of vegetative propagation in fruit trees, the author presents information useful to the fruit grower.

Cyanamid as an orchard fertilizer, F. N. Hewetson (*Michigan Sta. Quart. Bul., 20 (1938), No. 3, pp. 150–153*).—Based on results of 3 years' studies the author reports that no injury was observed in apple, pear, and plum trees receiving either fall or spring applications or to cherry and peach trees receiving fall applications of Cyanamid. When applied in spring to cherries and peaches, Cyanamid caused leaf burning and sometimes defoliation, particularly if the soil was too dry for the proper absorption of the fertilizer. Cyanamid may be applied in apparent safety to apples and pears in early spring, from 3 to 4 weeks before growth starts, if adequate moisture conditions prevail. Trees on heavy soils were less susceptible to injury from ill-timed applications than were those on sandy soils.

Comparative value of Cyanamid in fertilization of apple trees: Soil changes and tree response, G. E. Smith and A. E. Murneek (*Missouri Sta. Res. Bul. 273 (1938), pp. 52, figs. 16*).—Quantitative determinations for nitrate and ammonia nitrogen content were made on soil samples taken at various depths up to 18 in. under mature apple trees growing in sod and fertilized with Cyanamid, ammonium sulfate, and sodium nitrate in the fall and spring. With high moisture conditious the decomposition of Cyanamid was rapid, and in a few days the ammonia concentration in the soil was almost as high as from fertilization with ammonium sulfate. When no rain fell soon after the Cyanamid was applied, the quantity of available nitrogen in the soil was reduced below that found from the use of the two other materials. This difference suggested that a portion of the Cyanamid nitrogen either had been lost or tied up by some biological or physical process.

There was a significant and similar soil penetration of ammonia from Cyanamid and ammonium sulfate under optimal weather conditions. Very little variation was observed in rates of nitrification of nitrogen from Cyanamid and sulfate of ammonia, but the rapid absorption of nitrogen by the trees from these materials indicated that this transformation may not be necessary. If the ammonia content resulting from the application of fertilizers is taken as a

measure of the residual effect, then greater soil retention of nitrogen results from **fertilization with ammonium sulfate than from application of Cyanamid.**

The nitrate form of nitrogen was taken up more rapidly by the trees than the ammonia form, but the ammonia continued to be absorbed over a longer period. Sod was a serious competitor for nitrogen applied in the spring. This was in part responsible for the efficient utilization of nitrate of soda in the fall and the good results obtained from the spring application of Cyanamid, which has a temporary caustic effect on grass. Differences in growth and in nitrogen content of the developing parts of the fertilized trees were small but correlated well with variations in the available nitrogen of the soil. Fall applications of all forms of nitrogen fertilizers used gave equally good, if not better, results than spring applications. There was little difference in growth and nitrogen recovery from the three materials under favorable climatic and soil moisture conditions, and, with proper use, Cyanamid was found as satisfactory as sulfate of ammonia and nitrate of soda for fertilization of apple trees.

Root development of young Delicious apple trees as affected by soils and by cultural treatments, W. W. Yocum (*Nebraska Sta. Res. Bul. 95 (1937), pp. 55, figs. 19; also in Nebr. State Bd. Agr. Ann. Rpt., 1935, pp. 504–512, figs. 2*).—Studies begun by the station in the spring of 1932 on the effects of various cultural systems upon the root development of young Delicious apple trees carefully selected for uniformity prior to planting showed profound effects. At Lincoln, trees under straw mulch made the most extensive root development of any the first year. At Union, where trees were interplanted with corn, 3.5, 5, and 7 ft. from the tree rows, the smallest root systems were those nearest the corn. In the second year corn within 3.5 ft. of the trees greatly restricted lateral spread of roots, but with corn 7 ft. distant the roots were much the same as in the clean culture area. The depth of penetration was similar with all corn spacings, but the nearer the corn the more deep roots. In the second year at Lincoln, trees under mulch developed horizontal root systems extending from 9 to 10.5 ft. from the trunk, as compared with 7.5 ft. for the clean culture trees. At the end of the third growing season six mulched trees at Lincoln had an average root spread of 11 ft. on each side of the trunk, 2 ft. greater than that of the cultivated trees at Union. The average depth of rooting of the six mulched trees was 7.7 ft. The cultivated trees at Lincoln continued to root more deeply and spread less widely than the mulched trees. Changes in the system of culture at different stages showed that apple roots adjust themselves rather easily to changed environment.

Measurements of root tips indicated that apple roots make considerable growth while the top is dormant. Measurements of twig development of trees at Lincoln showed a correlation with root development, the maximum growth being on the straw-mulched trees. At Union the trees did not make as much twig growth as at Lincoln, and the nearer the corn rows, the taller the trees, due, apparently, to a more vertical type of growth. Under the dry conditions at Union, neither nitrogen nor phosphorus appeared to be a limiting factor to growth of either tops or roots of the cultivated trees.

In summing up, the author points out the extremely rapid rate of root development observed in young apple trees and the remarkable influence of moisture on root development. It is suggested that apple trees in eastern Nebraska should be spaced widely. In the case of 17-year-old Jonathan spaced 30 by 35 ft. apart in loess soil, roots overlapped in all directions and had reached a depth of from 30 to 35 ft. Practically every cubic foot of soil to this depth was occupied by roots.

The quantity of ethylene present in apples, R. C. Nelson (*Plant Physiol., 12 (1937), No. 4, pp. 1004, 1005, fig. 1*).—Describing equipment and methods designed for determining ethylene in plant tissues, the author reports that in McIntosh apples after storage for 9 mo. the ethylene content was of the order of 0.12 mg per kilogram of fresh tissue.

***The cool storage of peaches: In air and artificial atmospheres*, F. E. Huelin, G. B. Tindale, and S. A. Trout** (*Jour. Dept. Agr. Victoria, 35 (1937), No. 12, pp. 609–614*).—Investigations at the Government Cool Stores in Melbourne, Australia, showed that for the successful keeping of peaches the fruit should be picked when showing a considerable amount of blush but still firm, and stored promptly at 32° F. In ordinary air, the average storage life was about 6 weeks, while in artificial atmospheres containing from 8 to 10 percent of carbon dioxide the period could be lengthened by about 50 percent. Following storage, peaches must be transferred to 65°, or thereabouts, for adequate ripening.

An orange-colored bud sport of the Agen plum, C. F. Kinman (*Jour. Heredity, 28 (1937), No. 12, pp. 419, 420, fig. 1*).—The author reports the discovery in September 1935 near Sutter, Calif., of a branch of an otherwise normal Agen plum which bore fruits of an orange color. The distinguishing features were the orange color, larger size, smaller pits, and apparently greater productivity.

New and profitable varieties of small fruits, G. L. Slate (*Amer. Fruit Grower, 57 (1937), No. 3, pp. 7, 22, 34, figs. 2*).—Based on extensive tests at the New York State Experiment Station, descriptions and comments are offered on some of the more promising varieties of strawberries, raspberries, and other small fruits.

Insect pollination of cultivated blueberries, J. S. Bailey and F. R. Shaw (*Amer. Fruit Grower, 57 (1937), No. 3, pp. 8, 26, fig. 1*).—Observations by the Massachusetts Experiment Station on the different insects visiting blueberry bushes showed the three most numerous species to be honeybees, bumblebees, and solitary bees. The honeybee was the most numerous single species. In control tests in which a nucleus hive was placed in each cage and certain branches covered with cheesecloth to exclude bees, it was found that the set of fruit on the bee-exposed branches was as good as that on bushes freely exposed to all manner of insect visitation. Where the branches were covered with cheesecloth there was no set at all in the Harding and Grover varieties and a very slight set in the Pioneer variety. The authors conclude that the honeybee can be relied upon to accomplish blueberry pollination, and that package bees may be used where wild bees are lacking in abundance.

***Some effects of different storage temperatures on the keeping of cranberries*, R. C. Wright, J. B. Demaree, and M. S. Wilcox** (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 397–401, figs. 2*).—Of various temperatures from 30° to 70° F., tested by the U. S. Department of Agriculture for the keeping of cranberries, 36° proved most suitable for preserving the berries of the Early Black and Howes varieties in a marketable condition for both 2- and 4-mo. periods. At the end of 4 mo. there were 65 and 73 percent, respectively, of marketable fruits in the two varieties. Below 36° there was a marked decrease in decay, but low-temperature break-down became a serious factor. Berries were most attractive at 36° and 40°, but above 36° there was a tendency for the berries to increase in color to an undesirable degree. The various rots associated with cranberry losses in storage are listed.

Stability and instability of sexual conditions in *Morus alba*, J. H. Schaffner (*Jour. Heredity, 28 (1937), No. 12, pp. 426, 427*).—A change in a

single year from a pure male to a nearly pure female condition was observed in a young white mulberry tree. The only environmental change was from a rather droughty condition prior to the sex reversal to favorable moisture conditions at the time of its occurrence.

Preliminary report on raspberry root systems, A. S. COLBY (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 372–376, figs. 5*).—Examination at the University of Illinois of the root systems of field-grown Quillen black raspberry plants, Chief red raspberry, and two purple varieties obtained from crosses of Quillen × Starlight and Quillen × June showed that the distribution, concentration, and differentiation of roots was influenced by various factors, such as age of the plant, genetic origin, and soil moisture, aeration, and nutrient supply. It was observed that where roots had been cut in pruning operations, the injured tips were frequently infected with crown gall.

Interrelation of temperature and photoperiodism in the production of fruit-buds and runners in the strawberry, G. M. DARROW (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 360–363*).—At the U. S. D. A. Research Center, Beltsville, Md., several varieties of strawberries were exposed in the greenhouse, beginning September 1, 1935, to natural day (from 9.5 to 13.5 hr.) and to 14-hr. and 16-hr. day lengths. Beginning October 1, some plants of each light period were exposed to 70°, 60°, and 55° F.

The data show that regardless of temperature, short days favor flower production and inhibit the production of runners. At 70°, a 16-hr. day almost completely changed the plants from flower to runner production. At 70° and 14 hr. of light, runners were chiefly produced, but the indications were that the stage of flower production was nearly reached. At 60° and 14 and 16 hr. of light, runners alone were produced in November and December, but by March flower clusters were being produced freely by most varieties, especially in the 14-hr. group. At 55° and 14 and 16 hr. of light, runner growth was also limited. Important differences in varietal response were noted, for example, Burrill showed a much greater capacity to become reproductive under long days and relatively high temperatures than did Klondike. The correspondence of the experimental data with actual behavior in the field was noted for several varieties. Observations on potted plants of six varieties placed in the greenhouse at 14 and 16 hr. on September 1 and November 15, 1935, showed that the change from runner to fruit-bud production had already begun on September 1 in some plants of all varieties except Dorsett. A day of 16 hr. and 70° inhibited further initiation of fruit buds but did not inhibit the development of clusters already induced.

Pollination with particular reference to the grape, I, II, F. E. GLADWIN (*Amer Fruit Grower, 57 (1937), Nos. 3, pp. 9, 24, 25, 35, figs. 3; 4, pp. 16, 35, fig. 1*).—Studies at the Fredonia laboratory of the New York State Experiment Station emphasized the great importance of adequate pollination of certain varieties of the labrusca-type grape. Some of the self-sterile and imperfectly fertile varieties were as follows: Barry, Brighton, Herbert, Lindley, Eumelan, Salem, Wilder, and Vergennes. It was found that pollen could be dried and if kept dry held in good viable condition for several days and sometimes a few weeks. A variety known as Aramon × Rupestris Ganzin No. 1 was found to be an excellent producer of pollen. Mixed with lycopodium powder the pollen was effectively dusted on other varieties and gave particularly fine results on Eumelan, a valuable variety in the manufacture of wine but now little used because of its inferior fruit-setting characteristics. The clusters dusted with the above pollen combination yielded 50 percent more fruit than the untreated, due to the greater number of berries on the dusted clusters. From the results,

the author concludes that it is entirely feasible from a commercial standpoint to cross-pollinate certain varieties of grapes, thereby improving the appearance of the clusters as well as greatly increasing the yield.

Chlorophyll in Sultanina grapes and raisins, G. MACKINNEY (*Plant Physiol., 12 (1937), No. 4, pp. 1001–1004*).—Studies at the University of California indicated that the green coloring matter in Sultanina grapes is identified with chlorophyll. The ratio of the two components, *a* and *b*, was apparently greater than in normal green leaves. The chlorophyll was substantially unaltered in situ, but decomposed rather rapidly upon extraction if the original had been treated with sulfur dioxide.

Experiments with Hormodin on tropical and semi-tropical plants, J. V. WATKINS (*Florists Exch. and Hort. Trade World, 89 (1937), No. 3, pp. 20, 36, figs. 4*).—Information presented by the Florida Experiment Station indicates that root formation of cuttings of various semitropical and tropical species may be definitely stimulated by growth-promoting substances. A few species failed to respond under the conditions of the experiment, and the general responses were in the same order as would be anticipated from the behavior under normal conditions.

Experiments with Hormodin on semi-tropical plants, J. V. WATKINS (*Florists Exch. and Hort. Trade World, 90 (1938), No. 10, pp. 12, 13, 51, figs. 2*).—In this further report (see above) there are presented, largely in tabular form, the results of tests conducted by the Florida Experiment Station on a large number of species of ornamentals and fruit- and nut-bearing plants. The growth-promoting substance was effective over a wide range of concentrations, but there was some variation according to strength used. As indicated in the earlier paper, not all species responded to growth-promoting substances, among the negative being persimmon, black walnut, and pecan. However, many species which failed to root at all with tap water rooted successfully when treated with the chemical. In many cases where a few controls rooted, the chemical accelerated rooting, increased the percentage of success, and promoted a more substantial root system.

Further studies on the relation of low temperatures to granulation, E. T. BARTHOLOMEW and W. B. SINCLAIR (*Calif. Citrogr., 23 (1938), No. 4, pp. 163, 192*).—The cold winter of 1936–37 made possible an effective study at the Citrus Experiment Station, Riverside, Calif., of the relation of low temperature to the production of granulation in Valencia oranges.

A comparatively large percentage of the fruits showed freeze injury in the form of one or more collapsed segments, but with no indication of granulation. Some fruits showed one or more collapsed segments but with granulation in the stem end only. In all of the lots observed there were only four in which there were not one or more fruits that were granulated only. In one grove, which had been heated, 79 percent of the fruits were slightly to badly granulated, with no evidence of frost injury. In many cases the injury due to low temperature did not show until the middle or latter part of the picking season and was evident in isolated areas in any portion of the pulp, usually more frequently in the stylar half than in the stem half of the fruit. The data indicated that low temperatures may cause granulation to appear or increase in fruits that are predisposed to this condition but not in those which are not so predisposed. The indications were that a good portion of the trouble which is now classified as granulation may be avoided by keeping grove temperatures above the danger point. There was some evidence that the diffuse type of cold injury may appear in some fruits which have been subjected to temperatures which were low but not sufficiently so as to cause segment collapse.

Effect of hormones on the rooting of chrysanthemum cuttings, W. C. Cooper and J. B. Manton (*Florists' Rev., 80 (1937), No. 2070, pp. 18, 19, figs. 4*).—Stating that the chrysanthemum is among the species of plants that show a high degree of response to auxin treatment and that only 1 of 50 varieties tested failed to show increased rooting, the authors present data on a considerable number of varieties. The results indicated that the auxin treatment is valuable from the viewpoint of the home gardener and commercial grower. Definite advantages accrued from leaving some leaves on the cuttings.

Effect of zinc on rose growth, A. H. Marmon (*Florists' Rev., 80 (1937), No. 2068, pp. 19, 20*).—At the New Jersey Experiment Stations, Briarcliff rose plants grown in sand in glazed pots were supplied, in addition to a standard nutrient solution, with 0, 1, 10, and 50 p. p. m. of zinc. At the end of 2 weeks, the roots of the 50 p. p. m. plants had turned black, followed shortly by above-ground injury. After about 1 mo., the 10 p. p. m. lot exhibited some root injury, and after 2 mo., top injury. The plants receiving 1 p. p. m. of zinc made strong growth, better for a time than the controls, but after 4 mo. they exhibited some blackening of the roots. Whether zinc in very slight amounts may have a place in rose culture was said to be open to question.

The garden in color, L. B. Wilder (*New York: Macmillan Co., 1937, pp. [5]+327, pls. [200]*).—With plants arranged according to season of bloom, information is presented as to origin, important characteristics, culture, utilization in the garden, etc.

Gardening indoors: The enjoyment of living flowers and plants the year round, and new opportunities for home decoration, F. F. Rockwell and E. C. Grayson (*New York: Macmillan Co., 1938, pp. XVI+201, [pls. 39, figs. 8]*).—Information is presented as to the peculiar problems of indoor plant growing, adaptable species, terrariums, kinds of soil, propagation, control of insects, etc.

A program for shade trees in Oklahoma, K. S. Chester, H. J. Harper, R. C. Monosmith, and F. A. Fenton (*Oklahoma Sta. Bul. 234 (1938), pp. 45, figs. 17*).—This paper includes general information relating to adaptable species, selection of planting sites, methods of planting, cultural care, and the control of insect and fungus pests.

FORESTRY

[Forestry at the Cornell Station] (*[New York] Cornell Sta. Rpt. 1937, pp. 126–128*).—In reviewing accomplishments during the period 1887–1937, brief mention is made of studies in germination of forest tree seeds and the killing of undesirable trees with sodium arsenite.

Ohio Forest News, [February 1938] (*Ohio Forest News [Ohio Sta.], No. 33 (1938), pp. 16, pl. 1, figs. 15*).—This number is devoted entirely to a discussion of the historical aspects, development, and principal features of the Hocking Park State forest area.

[Shelterbelt species] (*Wyoming Sta. Rpt. 1937, pp. 36, 38, 41*).—Of several species planted at the Eden Substation in 1934, lanceleaf cottonwood, black cottonwood, and several willows survived without loss. Buffaloberry, native birch, and honeylocust suffered the greatest losses. At the Gillette Substation approximately 80 percent of the 7,000 trees set out since 1927 have survived and made good growth. Russian-olive, caragana, green ash, Chinese elm, American elm, boxelder, and ponderosa pine showed the most promise. At the Sheridan Substation mortality was high, especially in Chinese elm.

Kiln temperatures for jack pine cones, R. C. Rietz (*Jour. Forestry, 35 (1937), No. 12, pp. 1163, 1164, fig. 1*).—Indicating the necessity of kiln-drying

jack pine cones in order to obtain a high percentage of seed, the author reports that no appreciable reduction in seed viability resulted from exposure of freshly harvested cones to 170° F. for 6 hr. A temperature of 195° for 2 hr. reduced viability to practically 0°. A kiln temperature of 170° and a relative humidity of 30 percent were employed in extensive operations.

When does a pine tree complete its seasonal growth? F. G. GUSTAFSON (*Mich. Acad. Sci., Arts, and Letters, Papers, 22 (1936), pp. 83, 84, fig. 1*).—Observations by the University of Michigan on the development of young *Pinus sylvestris* trees about 1.3 m in height and growing on the north slope of a sandy loam hill showed that terminal growth is very rapid and, for practical purposes, is completed by the end of June. Lateral or diameter growth continued much later into the summer but was probably completed by the end of August.

Growth of spruce and fir in northern New Hampshire, A. B. RECKNAGEL (*Jour. Forestry, 35 (1937), No. 12, pp. 1148, 1149*).—Increment borings made in 1937 on spruce and firs growing in areas in Coos County, N. H., logged 60 yr. and 20 yr. earlier, showed a high productive capacity for softwoods and provided a preliminary basis for management plans for approximately 200,000 acres involved. In general, there was a close agreement between the growth rate in northern New Hampshire and in the Adirondack areas.

Growth and yield of cut-over stands of ponderosa pine in Arizona under different methods of cutting, H. KRAUCH (*Jour. Forestry, 35 (1937), No. 12, pp. 1134–1147, figs. 7*).—Between 1909 and 1913 there were laid out in the Coconino and Kaibab National Forests large plats of from 112 to 456 acres to obtain data on the growth of residual stands following cutting according to three methods, (1) group selection, (2) light group selection, and (3) scattered-seed-tree. Diameter growth was most rapid on the scattered-seed-tree plats, due not only to release but to the large-crowned, thrifty character of the trees. Between the two other groups there was, on the whole, no material difference in the same diameter and age classes. In all three plats, the rate of increment in volume began to decline gradually between 10 and 15 yr. after cutting. There was a direct relation between reserve volume per acre and gross increment per acre. The application of the findings to the determination of yields and cutting cycles was discussed.

Release cuttings in plantations of white and Norway pine, L. J. YOUNG and F. H. EYRE (*Mich. Acad. Sci., Arts, and Letters, Papers, 22 (1936), pp. 301–320*).—The release of young Norway pines growing in mixture with aspen proved well worth while. The suppressed pines benefited greatly, with the early reaction in the form of increased diameters. On most dry, sandy sites white pine benefited in its early years from an overhead cover, but after becoming established it needed release. Clear cutting is undesirable because of increased weevil damage. Underplanting of white pine on spots occupied by maple and juneberry was found inadvisable because of the prolific sprouting of the associated species after cutting. In the case of aspen, clear cutting may produce a mass of suckers more competitive than the original stand unless the pines are large enough to keep above the aspen. In the case of fully stocked oak stands, the stand should first be opened as much as possible, leaving enough oaks to protect the site and prevent serious inroads of white pine weevils. When red oak was cut, treatment of the stumps with creosote was found practical in eliminating sprouting. White oak 40 yr. old or more showed little tendency to sprout. Lopping and scattering of slash proved satisfactory in all cases.

How to cut southern farm timber for steady profit, W. R. MATTOON (*U. S. Dept. Agr. Leaflet 153 (1938), pp. 8, figs. 8*).—Practical suggestions are presented for the maintenance of permanent and profitable forests by means of selective cutting, fire protection, thinning of overcrowded stands, etc.

A study of logging damage in upland hardwoods of southern Illinois, J. G. KUENZEL and C. E. SUTTON (*Jour. Forestry, 35 (1937), No. 12, pp. 1150–1155, figs. 3*).—Observations by the Central States Forest Experiment Station, during the harvesting of a 20-acre tract of excellent hardwoods in southern Illinois in which 69 percent of the merchantable stand was removed, showed unreasonable damage in felling and by sawyers. Damage by swampers was in reasonable amount. In felling operations, ash and sassafras suffered a high degree of injury, 48 and 40 percent, respectively. Black gum was injured the least, with white oak next. The authors suggest that the economics of the combined logging and milling operations do not encourage the operator to protect the residual trees.

The small sawmill in New York, N. C. BROWN (*N. Y. State Col. Forestry, Syracuse Univ., Tech. Pub. 50 (1937), pp. 126, figs. 52*).—This presents the results of a study of the methods pursued in logging woodlands for small sawmills, together with the manufacturing and merchandising of the product. The conclusions deal mainly with the economic and general management phases of the subject.

DISEASES OF PLANTS

The Plant Disease Reporter, February 15, March 1, March 15, and April 1, 1938 (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 22 (1938), Nos. 3, pp. 55–63, figs. 2; 4, pp. 65–71; 5, pp. 73–94, figs. 5; 6, pp. 95–105, figs. 4*).—The following matters are included:

No. 3.—Relation of temperature to fall damage of strawberries by leaf scorch (*Diplocarpon earliana*), by G. A. Meckstroth; diseases of shade and ornamental trees (summary of specimens received in 1937 at the New Haven (Conn.) office, Division of Forest Pathology), by A. M. Waterman; tobacco downy mildew (*Peronospora tabacina*) appears in Georgia, by E. E. Clayton; and brief notes on plant diseases, including internal discoloration of potato tubers in Maine, November and December, potato late blight and other plant diseases observed in Florida, and a scab-like spot (showing a *Cladosporium*-like growth) on holly leaves in Oregon.

No. 4.—The present status of chestnut blight in the Pacific Northwest (British Columbia, Oregon, and Washington), by J. L. Bedwell; new records of *Dothidella castanicola* and *Gnomoniella corylii* from Oregon, by A. E. Jenkins; *Cryptodiaporthe castanea* on Asiatic chestnuts, by M. E. Fowler; maturation of perithecia of the apple scab fungus in Missouri, 1938, by M. A. Smith; further notes on tobacco downy mildew (Georgia and Florida); *Heterosporium* leaf spot of carnation in Oregon, by F. P. McWhorter; and *Phyllosticta* leaf spot of snowberry (*Symphoricarpos albus*).

No. 5.—Serum diagnosis of virus diseases of tobacco, by P. R. Miller; tests of strains of tobacco mosaic virus with Chester's field test, by W. D. Valleau and S. Diachun; cucumber mosaic in greenhouse petunias, by K. S. Chester; occurrence of curly top in the Pacific Northwest in 1937, by B. F. Dana; *Cylindrocladium scoparium* associated with diseases of tree seedlings, by L. W. R. Jackson; additional records of violet scab (*Sphaceloma violae*), by A. E. Jenkins; reports on tobacco diseases in Georgia, including downy mildew (*Peronospora tabacina*) and chlorine injury in tobacco plant beds; development of the apple scab fungus in New Hampshire in 1938, by S. Dunn, with additional reports on the development of the fungus this year in Pennsylvania, Indiana, and Illinois; brief notes on *Botrytis* stem rot on tomatoes and *Sclerotinia* stem rot of crimson clover in Virginia; and notes on the development of the perfect stages of *Venturia inaequalis* and *Sclerotinia fructicola* in northwest Arkansas in 1938, by J. C. Dunegan.

No. 6.—**Fourth experimental forecast of the incidence of bacterial wilt of corn, by N. E. Stevens and C. M. Haenseler**; hop diseases in New York in 1937, by R. O. Magie; additional reports of tobacco downy mildew (*Peronospora tabacina*) for Georgia, South Carolina, and North Carolina; and brief notes on plant diseases, including *Botrytis* rot of apple in Delaware, a severe outbreak of leafspot in iris in North Carolina, and rusts on wheat and oats in Texas.

[Plant disease work by the Maine Station] (*Maine Sta. Bul. 387 (1937), pp. 227–240, 252, 253, 254, 255*).—Reports of progress are included on Green Mountain seed potato plats in relation to virus diseases, by D. Folsom; the value of selecting seed stock free from Rhizoctonia, by R. Bonde and L. A. Schaal; spraying and dusting potatoes, including comparisons of different spray schedules, yields at different dates of potatoes receiving different fungicidal treatments, the effects of added compounds on the adhesiveness of bordeaux mixture and copper lime dust, a late blight or rust epidemic on an Aristook County farm in 1936 in relation to environal conditions and spray treatments, comparison of bordeaux mixture and basic copper sulfate, dusting v. spraying of different potato varieties, comparisons of copper cyanamide and other spray fungicides, yield comparison with dolomitic hydrated lime v. high calcium hydrated lime in bordeaux preparation, yield comparison with different amounts of lime in the bordeaux formula, and new rust-resistant potato varieties developed in cooperation with the U. S. Department of Agriculture, by Bonde; a bacterial wilt and soft rot of potatoes in Maine, by Bonde (E. S. R., 77, p. 349); some epixylous fungi of Maine, by M. T. Hilborn and F. H. Steinmetz (E. S. R., 76, p. 339); and recent developments in potato breeding for resistance to virus diseases, by E. S. Schultz, C. F. Clark, W. P. Raleigh, F. J. Stevenson, Bonde, and J. H. Beaumont (E. S. R., 77, p. 349).

[Plant disease work by the New Mexico Station] (*New Mexico Sta. Rpt. 1937, pp. 44–51, figs. 2*).—A rather detailed progress report is given on studies of the histology and physiology of potato plants affected with psyllid (*Paratrioza cockerelli*) yellows, the feeding method of the nymphs, control experiments for the insect, and the effects of various mineral nutrients in addition to a standard fertilizer on the vigor and resistance of the plants to this pest, with briefer reports on apple measles, chlorosis, and Texas root rot of trees.

Plant pathology (*[New York] Cornell Sta. Rpt. 1937, pp. 139–147*).—A historical account is given of the work of the station in plant pathology since its establishment, together with its more recent progress in the study of fungicides, of diseases of fruits, cereal and meadow crops, field and vegetable crops, potatoes, and ornamentals, and in the study of mycology.

[Plant disease work by the North Carolina Station] (*North Carolina Sta. Rpt. 1935, pp. 29–32, 40, 41, 59–62, 65, 66, fig. 1*).—Reports of progress are included on the survival of tobacco mosaic in the soil, by S. G. Lehman; control of the Granville tobacco wilt, and a study of the effects of chemical treatment of the soil on the control of black shank (*Phytophthora nicotianae*) of tobacco, both by R. F. Poole; wheat breeding for rust resistance, by P. H. Kime, Lehman, and W. E. Adams; tests of wheat hybrids and selections for rust resistance, and barley seed treatment for loose and covered smut, both by Lehman; studies on the control of bacterial spot of peach (*Bacterium pruni*), and the results of further work (E. S. R., 73, p. 635) on the control of arsenical injury on peach, both by Poole; and control of sweetpotato diseases, by Poole.

[Plant disease work by the Texas Station] (*Texas Sta. Rpt. 1936, pp. 9, 10, 85–107, 108–111, 111–116, 158, 159, 202, 203–206, 215, 216, 219, 220, 259–261, 298–302, 311, 312*).—Progress reports are given by various authors (J. J. Taubenhaus,

W. N. Ezekiel, G. M. Watkins, J. F. Fudge, P. Macy, G. E. Allstatt, C. H. McDowell, L. E. Brooks, P. A. Young, H. F. Morris, G. T. Boyd, H. P. Smith, A. L. Burkett, J. N. Roney, W. J. Bach, D. C. Bain, R. H. Wyche, E. Gelber, D. L. Jones, C. H. Rogers, I. M. Atkins, and P. B. Dunkle), including the vegetative stage of *Phymatotrichum omnivorum* on roots at various depths, persistence and longevity of the fungus in its sclerotial stage, depth of sclerotium formation in the field, variation and dissociation of the fungus, the *Phymatotrichum* spore stage, some Basidiomycetes associated with plants killed by root rot, a new *Phymatotrichum* (*P. silvicolum*), the effects of environal factors on the root rot fungus (nutritional factors, nature of immunity of monocotyledonous and discotyledonous plants to root rot, growth of the fungus on roots of cotton varieties under different soil and climatic conditions in Texas, growth in soil cultures from root rot spots, growth in soils with high concentrations of commercial fertilizers, growth in wood decoctions, effects of other organisms on growth of the root rot fungus, antagonism of *Rhizoctonia* to hyphae of the root rot fungus, and the cytology of host-parasite relations), and experiments on control (cotton from X-rayed seed, resistance of grapes to root rot, susceptibility of apple varieties, rotation with sorghum, graminaceous barriers, use of sulfur slabs, and immunizing by acidifying the cell sap); tomato diseases, including spotted wilt and dwarf mosaic (probably not seed-borne), a virus disease survey, hosts of spotted wilt, hosts of fern leaf mosaic, hosts to curly top of tomato and spinach, tomato seed carriers of *Fusarium lycopersici* wilt, preparation of large-scale field inoculum of *F. lycopersici*, viability of *F. lycopersici*, selection for *Fusarium* wilt resistance, X-rays in production of wilt-resistant tomatoes, viability of *Sclerotium rolfsii*, crown rot and stem canker, anthracnose, *Myrothecium* strains infecting tomato, effects of medicated wraps or dips on storage-rot control, Aspergilli causing storage rots, disease control in fall-grown tomatoes, and damping-off control; diseases of roses, including *Diplodia* die-back, black spot studies, including control, seasonal prevalence and viability of the fungus spores, inoculations with spores of *Actinonema rosae*, adhesiveness of various fungicides, defoliation by $CuSO_4$–H_2SO_4 spray, and storage tests; garlic diseases, including transmission of bacterial soft rot, organisms isolated from infected bulbs, disinfection of garlic cloves to control disease, and artificial curing of garlic; milo diseases; sorghum diseases; fungicidal studies, including the properties of sulfur and Cuprocide, the effect of Cuprocide on the germination of spores of *Actinonema rosae*, control of damping-off of cotton, tomato, and spinach seedlings, adhesiveness of various dusts to spinach seed, control of cotton diseases, corn smut, and *Cercospora beticola* leaf spot of beets, foliage injury to various plants by sulfur-lead arsenate-Cuprocide dust, control of fig diseases and strawberry chlorosis, potato scab control, field control of citrus diseases, and the effects of medicated wraps and dips, sulfur, and sulfur compounds on the control of citrus decay in storage; the effects of various dilutions of H_2SO_4 on plant foliage; fungi and bacteria recovered from cottonseed delinted with H_2SO_4; germination and yields from acid-delinted cottonseed; rice diseases, including rice dwarf, varietal susceptibility to black kernel, micro-organisms recovered from polished and unpolished rice with black kernel disease, effects of various shock covers on the prevalence of this disease, and rice black smut *Tilletia horrida; Verticillium alboatrum* wilt of cotton; testing wilt-resistant varieties of watermelon, and stem-end rot of watermelon; stem-end rot of citrus; witches' broom of peanuts; *Choanephora cucurbitarum* causing squash disease and fig decay; a hollyhock rust (*Puccinia*) new to Texas; bloom blight of Easter lilies due to *Fusarium* sp.; a fungus-induced blossom-end rot of pomegranates; X-rays in the development of Texas

bluebells resistant to *Sclerophoma eustomonis* blight; black bundle disease (*Cephalosporium acremonium*) of corn; mulberry swells or "pop corn" disease (*Sclerotinia carunculoides*); *Helminthosporium* decay of ornamental cactus (*Echinocereus chloranthus*); *V. alboatrum* wilt of dahlias; gourd seed as carriers of *Sclerotium bataticola; Testicularia cyperi* smut on horned rush *Rhynchospora corniculata interior; Cercospora seminalis* disease of buffalo grass *Buchloe dactyloides;* lumber decay by various fungi; germination of cottonseed treated with Ceresan, lime, and sulfur; 24 diseases not previously reported from Texas listed; fig mosaic; yellow dwarf of onion and related plants; plant disease survey; nematode control work on figs; investigations by the Temple Substation on cotton root rot, including viability of sclerotia, effects of clean fallow, effects of continuous sorghum on root rot, rotations as affecting sclerotial viability and distribution, effects of certain chemicals on the production of cotton and cowpeas in root rot areas, analyses of cottonseed from green cotton plants and from those killed by root rot, angular leaf spot on different varieties of cotton, and diseases of miscellaneous plants; work by the Denton Substation on wheat leaf and stem rust, bunt, and loose smut; work by the Jacksonville Tomato Disease Laboratory on the effects of certain sprays and dusts on tomato foliage and fruit, varietal susceptibility to *F. lycopersici*, attempts to secure wilt resistant tomatoes, light and chemical seed and soil treatments for damping-off, chemical soil treatments for nematodes, and miscellaneous diseases including a plant disease survey, work on a drought-resistant potato, and tests of wilt-resistant watermelons; work by the Weslaco Substation on cotton root rot, including grape and citrus rootstock resistance tests, resistance of winter and summer legumes and of ornamentals, the occurreuce of root rot on vegetable crops, tree injections for root rot control on citrus, the occurrence of root rot spore spots, the effects of sulfur treatments of the soil and in sprays and dusts on citrus, stem-end rot in early citrus fruit, root rot on other crops, and other plant diseases; and work by the Iowa Park Substation on root rot, including sorghum as a root rot remover, cotton from X-rayed seed, and tests of the hardiness of various grape stocks showing marked resistance to root rot.

Plant diseases (*Wyoming Sta. Rpt. 1937, pp. 8, 9*).—Brief progress reports are given on selective breeding of alfalfa resistant to bacterial wilt, the etiology and iron treatment of cottonwood chlorosis, seed treatment for wheat bunt, seed tuber treatment for scab and *Rhizoctonia* of potatoes, and seed treatments for peas, beans, and sweet corn.

Pioneers in the study of virus diseases of plants, M. T. Cook (*Sci. Mo., 46 (1938), No. 1, pp. 41–46, figs. 8*).—This contribution by the Puerto Rico College Experiment Station is a brief review of pioneer work on the virus diseases of plants, and includes portraits of A. E. Mayer, D. J. V. V. Iwanowski, H. M. Quanjer, M. W. Beijerinck, E. F. Smith, A. F. Woods, H. A. Allard, and J. Johnson.

Local virus infections in relation to leaf epidermal cells, L. W. Boyle and H. H. McKinney (*Phytopathology, 28 (1938), No. 2, pp. 114–122*).—Additional data (E. S. R., 77, p. 494) on the results of different methods of inoculation are compared to determine the relative importance of trichomes, stomatal openings, and other epidermal cells as points of entry for virus when leaves of *Nicotiana* and *Capsicum* species are inoculated by wiping. The coincidence of broken trichomes to local infections was largely a matter of chance, and the number of infections was not necessarily proportional to the number of trichomes per unit area. The larger percentages of infection occurred through slightly injured epidermal cells other than trichomes. There was no correlation between the number of stomatal openings and the number of local infections obtained as leaves were wiped.

The carbon metabolism of Fusarium lycopersici on glucose, G. H. Pritham and A. K. Anderson (*Jour. Agr. Res.* [*U. S.*], *55* (*1937*), *No. 12, pp. 937–949, figs. 4*).—In this study by the Pennsylvania Experiment Station, the tomato wilt organism *F. lycopersici* on a medium of mineral salts and glucose grew well at pH 2.0–9.5, its limits being 1.88–11.06. During growth the final pH of the medium changes to 4.25–4.95. The principal products of metabolism are CO_2 and alcohol. Data are given showing the distribution of CO_2 in the various metabolites at various stages of growth during 60 days. The organism grew on a medium containing alcohol as the only carbon source, but was seriously inhibited when the amount reached 4 percent or more by volume.

The Uredinales of West Virginia, C. R. Orton (*W. Va. Univ. Bul., 38. ser., No. 3–II* (*1937*), *pp. 83–87*).—The author summarizes data presented in three previously published lists of West Virginia rust fungi, lists additions with counties where collected, and appends a list (with their hosts) of the 23 known species of rusts occurring in the State which may be claimed to be of economic importance.

Two hyphomycetes parasitic on oospores of root-rotting oomycetes, C. Drechsler (*Phytopathology, 28* (*1938*), *No. 2, pp. 81–103, figs. 5*).—Of two moniliaceous fungi found vigorously parasitizing oospores of pythiaceous root-rotting fungi, one with mostly triradiate and cruciform conidia was identified as *Trinacrium subtile*. The other with regularly triseptate *Fusarium*-like conidia is described as *Dactylella spermatophaga* n. sp. Despite conspicuous differences in conidial design, the two appear closely related. Because of its failure to produce compound conidial apparatus, and in view of its resemblance to *D. passalopaga* (a rhizopod-capturing form) and *D. leptospora* (a nematode-capturing species), *D. spermatophaga*, together with *T. subtile*, are considered related taxonomically to the predacious hyphomycete series rather than to *Fusarium*. *D. spermatophaga* has been observed to appear spontaneously in numerous isolation cultures from diseased portions of many host plants obtained in a number of different localities representing collectively a wide variety of environal conditions. In these cultures it was found destroying oospores of *Pythium arrhenomanes, P. butleri, P. complens, P. debaryanum, P. irregulare, P. mammillatum, P. oligandrum, P. paroecandrum, P. salpingophorum, P. ultimum,* and *P. vexans*. Grown in dual culture with other oomycetes it parasitized abundantly also the oospores of *P. acanthicum, P. anandrum, P. dissotocum, P. graminicolum, P. helicoides, P. mastophorum, P. myriotylum, P. oedochilum, P. palingenes, P. periilum, P. periplocum, P. polymastum, P. polytylum, P. scleroteichum, Phytophthora cactorum, P. megasperma,* and *Aphanomyces euteiches*. Infection is accomplished by successive perforation of the oogonial and oospore walls, followed by development within the oospore of a branched, somewhat lobate, and rather massive haustorium that appropriates the protoplasmic contents.

Because of its evident capacity for widespread destruction of oospores, on which root-rotting oomycetes mainly depend for survival, *D. spermatophaga* presumably serves in promoting soil sanitation over extended periods. A similar role in the long-time bionomics of soil-borne oomycetes is played by various amoebae and testaceous rhizopods. On the other hand, parasitic chytrids operate not so much to destroy oospores already formed as to prevent their development, while putrefactive bacteria exert a pervasively debilitating effect on the mycelium of root-rotting oomycetes. Under natural conditions this virtually restricts the slow-growing oomycetous forms to strictly parasitic relationships, though permitting the occurrence of faster-growing forms in saprophytic and semiparasitic as well as wholly parasitic relationships.

A bibliography of 41 titles is appended.

Gill fungi associated with the roots of cereals, R. SPRAGUE (*Phytopathology, 28 (1938), No. 1, pp. 78, 79, fig. 1*).—In this cooperative study by the U. S. D. A. Bureau of Plant Industry and the Oregon Experiment Station, *Pholiota dura, P. praecox, Naucoria* sp., and other gill fungi were often found associated with the crowns and roots of cereals in western Oregon. Inoculations with an undetermined fungus and with *P. dura* caused no injury to wheat, oats, barley, rye, or einkorn. In fact, the inoculated plants were always taller and stronger than the noninoculated ones.

The association of bunt with loose smut and ergot, W. F. HANNA (*Phytopathology, 28 (1938), No. 2, pp. 142–146, fig. 1*).—Heads of Kota wheat infected with both loose smut *Ustilago tritici* and bunt *Tilletia tritici* were found in the field and produced experimentally in the greenhouse. Only 44 percent of the seeds inoculated with these two smut fungi produced mature plants, as compared with 97 percent for noninoculated seeds. Competition between the two fungi resulted in a marked suppression of infection by *T. tritici*. On several varieties of wheat bunt balls containing spores of *T. tritici* were found fused to the projecting tips of ergot (*Claviceps purpurea*) sclerotia.

Host range and identity of the smut causing root galls in the genus Brassica, B. B. MUNDKUR (*Phytopathology, 28 (1938), No. 2, pp. 134–142, figs. 3*).—In India, *B. campestris sarson* plants are attacked by a smut producing root galls. No other part of the plant is attacked, and it is sometimes difficult to identify the disease, since the aerial parts show no symptoms. Affected plants are rather stunted and mature earlier than normally. The smut causes considerable reductions in yield, as experimentally demonstrated. The disease is soil borne, and the galls are capable of spreading the infection. Besides Indian mustard, several other Brassicas, including radish, turnip, and cabbage, are attacked. The fungus was shown to be incapable of attacking *Turritis glabra* or *Matthiola sinuata*, species on which *Urocystis coralloides* is pathogenic. This fact and the spore measurements indicate the Indian smut fungus to be a new species, *U. brassicae*.

Cytology of Phymatotrichum root rot of cotton seedlings grown in pure culture, G. M. WATKINS (*Amer. Jour. Bot., 25 (1938), No. 2, pp. 118–124, figs. 21*).—Following pure culture inoculation with *P. omnivorum* the hyphae accumulate over the seedling root surface to form a considerable weft. In this study at the Texas Experiment Station, sections of roots fixed during this and subsequent stages indicated that the external agglomeration either induces death and break-down of the epidermis and successive layers of the cortex until only the central cylinder is left, or individual hyphae penetrate the epidermal cell walls with little or no constriction and ramify through and between all cells of the cortex, endodermis, and pericycle, finally reaching the xylem tracheids. In either mode of attack there was evidence of chemical action by fungus secretions on the host cells, but none for the "mechanical wedge" type of penetration which has been reported for this root rot under field conditions.

Observations on the loose kernel smut of Johnson grass, C. O. JOHNSTON, C. L. LEFEBVRE, and E. D. HANSING (*Phytopathology, 28 (1938), No. 2, pp. 151, 152, fig. 1*).—The similarity of the causal organism to *Sphacelotheca holci* and *S. cruenta* is discussed in this joint contribution by the U. S. D. A. Bureau of Plant Industry and the Kansas Experiment Station. The induced dwarfing and early heading of infected Johnson grass are also noted. The disease resembles rather closely the one due to *S. cruenta*, but only further studies (including hybridization) will establish the identity of the parasite.

A dry-rot disease of Opuntia, B. O. Dodge (*Jour. N. Y. Bot. Gard., 38 (1937), No. 451, pp. 170–172, fig. 1*).—This note reports and describes a tough, black, crustlike dry rot of prickly pear associated with a fungus.

A further study of the dry-rot disease of Opuntia, B. O. Dodge (*Mycologia, 30 (1938), No. 1, pp. 82–96, figs. 5*).—Continuing the study of the *Opuntia* dry rot from New Mexico noted above, the host invasion by the fungus was found to be fairly rapid at first, but as the spots enlarged a callus was formed cutting off the healthy tissue from the advancing parasite. The only fruiting bodies thus far developed are pycnidiumlike structures, possibly spermogonia, the cavities of which are developed in stromatic tissue through disorganization. A comparison was made with diseased material from Texas, Bermuda, and other southern regions. The Bermuda specimens bore 3–4 different types of fruiting bodies, the one most common being named *Leptodermella opuntiae* n. sp. The fungus from the New Mexico specimens is provisionally referred to *Phyllosticta concava*.

The purpose of the paper was primarily to demonstrate that there is still important work to be done before the life histories of the several fungi causing diseases of *Opuntia* are fully cleared up.

The influence of environmental conditions at planting time on sorghum kernel smut infection, L. E. Melchers and E. D. Hansing (*Amer. Jour. Bot., 25 (1938), No. 1, pp. 17–28, figs. 2*).—Field experiments with kafir by the Kansas Experiment Station are said to have substantiated the conclusions of Reed and Faris (E. S. R., 56, p. 651) regarding environal effects on sorghum infection by *Sphacelotheca sorghi* under controlled greenhouse conditions. Soil temperature and moisture proved to be interdependent factors in determining infection, medium to low degrees for both apparently conducing to maximum infection. However, fair infection occurred over a wide range of soil temperature and moisture. Heavy kernel smut infection occurred at any temperature below 75° F. allowing the seed to germinate. In fact, low temperatures were consistently associated with high smut infection, and an absolute minimum of 28° during the infection period was no hindrance. In general, when the mean maximum soil temperatures during an infection period were 75° or above, the amounts of infection were reduced. However, one or two high temperatures during the germination or infection periods may inhibit infection, even though the average does not appear adverse. Soil moistures of 28 percent or more (dry basis), even with favorable soil temperatures, reduced infection considerably. Apparently, low soil moisture (below 8–10 percent) reduced the amount of infection, but when the soil moisture remained at this point sorghum seed failed to germinate. With soil moisture sufficient for seed germination, following rains, some infection may occur, indicating that as far as soil moisture is concerned smut infection may occur whenever sorghum seed germinates readily.

In the five years' work, the early plantings (March) were not killed by freezing. In the vicinity of Manhattan, varietal reactions to smut can be best determined by planting 10–14 days earlier than is recommended for general practice, and, ordinarily, plantings as late as July may escape infection, though early frosts do not allow the crop to mature normally.

Further studies on the parasitism of Rhizoctonia solani on sugar beets, E. L. LeClerg (*Phytopathology, 28 (1938), No. 2, pp. 152, 153, fig. 1*).—In continuation of this work by the Minnesota Experiment Station and the U. S. D. A. Bureau of Plant Industry (E. S. R., 72, p. 206), 28 strains of *R. solani* from severely affected potato sprouts caused decay following inoculation into sugar

beets, while 116 isolates from lesions on older potato plants or from sclerotia on tubers failed to do so.

Water soaking of leaves in relation to development of the blackfire disease of tobacco, E. E. Clayton (*Jour. Agr. Res.* [*U. S.*], *55* (*1937*), *No. 12, pp. 883–889, figs. 5*).—Tobacco leaves are readily infected by *Bacterium angulatum* (=*Phytomonas angulata*), but under ordinary conditions invasion is limited to small areas. The lesions are usually ⅛ in. or less in diameter, and large numbers of infections cause but little damage to most tobacco types. It had been suggested that the large, quickly developing lesions characteristic of epidemic blackfire are nonparasitic, but it is now shown that they are due to *B. angulatum*, though only under special conditions. The resistance to leaf invasion must first be broken down by water soaking, which in turn results from severe storms. Even after leaves are water soaked and infection has occurred, development of the disease is abruptly checked if the water-soaked condition disappears within a few hours. Epidemic disease development was repeatedly obtained by water soaking the leaves for 48 hr. High topping and low-nitrogen and high-potash fertilization were found to increase leaf resistance to water soaking, and these measures are recommended as practicable for blackfire control in the flue-cured tobacco area.

Blue mold (downy mildew) disease of tobacco, E. E. Clayton and J. G. Gaines (*U. S. Dept. Agr., Farmers' Bul. 1799* (*1938*), *pp. II+16, figs. 9*).—This is a compendium of information on the symptoms of tobacco blue mold, the life history of the causal fungus (*Peronospora tabacina*), other hosts (slight injury to pepper, tomato, and eggplant), losses induced, and control by cultural practices, heat and gas treatments, and spraying. Information is also given on spray equipment, materials and methods, schedules, methods of application, and spray injury. The spray formula recommended is copper oxide 0.5 lb., Lethane spreader 1 qt., cottonseed oil 0.5 gal., and water to make 50 gal.

Tobacco mosaic sources of infection and control, W. D. Valleau and E. M. Johnson (*Kentucky Sta. Bul. 376* (*1937*), *pp. 221–262, fig. 1*).—Prevention of initial infection in the plant bed and field, together with roguing (before cultivation) when necessary, proved effective in both experimental and commercial mosaic control. Field and plant bed infection apparently occurred most frequently from workers' hands contaminated by tobaccos used for smoking or chewing, air- and fire-cured tobaccos from infected crops being highly viruliferous. In general, manufactured tobaccos appeared to be quite or nearly free from virus and safe for use while setting the plants. Unless virus-free, they are probably unsafe for use while weeding.

It is possible that infected perennial solanaceous weeds may constitute a virus reservoir. They cannot be disregarded in tracing initial infections, although the evidence for this source is thus far only circumstantial. Insect vectors play a minor role, if any, in initial infection in the field. In the South, where roots overwinter and mosaic suckers are produced, they undoubtedly infect an occasional plant, but farther north, where plants do not survive the winter, there is evidence of only very slight infection from virus overwintering in the soil. Where tried, roguing has proved successful in preventing infection in these ways if other sources have been eliminated. However, where infected tobacco trash has been applied to the land shortly before setting, heavy losses may follow in spite of roguing.

Detailed procedures for mosaic control, based on these findings, are given.

Inactivation of tobacco-mosaic virus in cured tobacco leaves by dry heat, H. H. Thornberry, W. D. Valleau, and E. M. Johnson (*Phytopathology, 28* (*1938*), *No. 2, pp. 129–134, fig. 1*).—In studies by the Kentucky Experiment Sta-

tion, the dry-thermal inactivation rate of the virus in cured White Burley tobacco leaves was determined for the yellow, green, and burning strains in recently cured tobacco and for virus in tobacco cured in 1882. The virus in green tissues also was exposed to some of the temperatures tested. The tabulated data indicate that the moisture content and virus infectivity diminished with time at the various temperature exposures, differences among the virus strains not being apparent. Complete inactivation times at 80°, 90°, 100°, 110°, 120°, 130°, 140°, and 150° C. were 50, 20, 10, 5, 1, 0.5–0.4, 0.4, and 0.4 hr., respectively. Comparisons of virus inactivation with denaturation of proteins and killing of vegetative cells by dry heat are discussed. Virus inactivation in cured tobacco by dry heat promises to aid in the control of mosaic in tobacco beds and fields by reducing the common source of inoculum under Kentucky conditions.

Seasonal variations in susceptibility of tobacco to infection with tobacco-mosaic virus, E. L. Spencer (*Phytopathology, 28 (1938), No. 2, pp. 147–150, figs. 2*).—Results from 129 consecutive weekly tests indicated definite variations in the susceptibility of small Turkish tobacco plants (*Nicotiana tabacum*) to infection, each being inoculated by a single needle puncture in the youngest leaf over 0.5 cm long. Susceptibility was high during early summer (with high temperature and long duration of sunshine), and low during late winter and early spring. The incubation period within the plant showed a direct correlation with seasonal fluctuations in light and temperature, being short during early summer and long during winter.

Taxonomic relationships of plants susceptible to infection by tobacco-mosaic virus, F. O. Holmes (*Phytopathology, 28 (1938), No. 1, pp. 58–66, fig. 1*).—Of 73 herbaceous dicotyledonous species tested, 46 proved susceptible on the criteria of detection of virus increase in inoculated leaves by quantitative subinoculation tests and observation of symptoms at inoculation site. A correlation seemed to exist between accepted taxonomic classification and susceptibility, since almost all of the species tested in one group of 11 families apparently lacked ability to support increase of tobacco-mosaic virus, whereas 95 percent of the species in another group of 14 families possessed this ability.

Crystallization of tobacco-mosaic virus protein, H. H. Thornberry (*Science, 87 (1938), No. 2248, pp. 91, 92*).—The author outlines three procedures for crystallization of this virus protein. Juice from healthy tobacco plants treated similarly failed to develop evidence of crystalline protein.

The zinc chloride treatment for fire-blight, D. Cation (*Michigan Sta. Quart. Bul., 20 (1938), No. 3, pp. 179–183, figs. 2*).—This paper briefly describes, with detailed procedures, the zinc chloride-alcohol drenching method of treating fire blight cankers, and reports its successful use in a test under Michigan conditions.

Blueberry galls produced by the fungus Phomopsis, N. A. Brown (*Phytopathology, 28 (1938), No. 1, pp. 71–73, fig. 1*).—The etiological relation of *Phomopsis* sp. isolated from galls common on cultivated blueberry was demonstrated by inoculation tests. It is stated to differ from the one inducing stem-tip blight on this host. Galls were also induced by inoculating *Jasminum nudiflorum* and *Viburnum opulus* with this *Phomopsis*.

Elsinoë on lemon fruits from Paraguay, A. E. Jenkins (*Phytopathology, 28 (1938), No. 1, pp. 73–75, fig. 1*).—What is regarded as *E. australis* was found in its conidial stage (*Sphaceloma*) on lemons from San Lorenzo, Paraguay, received at the port of New York in May 1937. This identification was confirmed by letters from H. S. Fawcett and A. A. Bitancourt, stating that in April they had observed what they considered to be the same fungus on lemon

fruits growing in the same Paraguayan locality. The susceptibility of lemon to attack by what appears to be *E. australis* had not previously been known.

Some effects of storage conditions on certain diseases of lemons, C. Brooks and L. P. McColloch (*Jour. Agr. Res.* [*U. S.*], *55* (*1937*), *No. 11*, *pp. 795–809, figs. 12*).—Storage experiments were carried out on green, silver, and mature lemons forwarded from Los Angeles, Calif., to Washington, D. C. *Pitting did not occur in 60° F. storage, was seldom serious at 50°, but was the great limiting factor in storage at lower temperatures, being worse at 32° and 36° than at 40°. Holding the lemons at 32°, 36°, or 40° for 1–2 weeks before storing at a higher temperature did not increase the pitting. Lemons remained almost entirely free from membranous stain when stored at either 32° or 60°, but became seriously affected at 36° and 40°. Those that were waxed and those receiving high prestorage CO_2 treatment developed fewer pits and less membranous stain than the controls, but the latter treatment tended to delay color development. Watery break-down was sometimes serious in 32° storage, but did not occur at higher temperatures. Scald and red blotch were occasionally found on fruit held at low temperatures. Waxed fruit lost weight and firmness very much more slowly than the unwaxed. No injury resulted from accumulation of low percentages of CO_2 in the storage air, and none from prestorage exposure to high percentages.

Water spot of navel oranges, L. J. Klotz and A. J. Basinger (*Calif. Citrogr.*, *23* (*1938*), *No. 3*, *p. 115, fig. 1*).—This brief, preliminary note on a nonparasitic break-down of the rind of citrus fruits is a contribution from the California Citrus Experiment Station. Early picking, orchard heating, windbreaks, and careful orchard practices to avoid fruit injury are said to be important in decreasing losses from water spot.

An Elsinoë causing an anthracnose on Hicoria pecan, A. E. Jenkins and A. A. Bitancourt (*Phytopathology*, *28* (*1938*), *No. 1*, *pp. 75–78, figs. 2*).—*E. randii* n. sp., causing anthracnose of pecan (*H. pecan*), was recently discovered at Campinas, São Paulo, Brazil, by A. S. Costa. This fungus, which has been isolated from single ascospores and acervuli, is the organism from pecan in the United States provisionally identified by Rand (E. S. R., 30, p. 452) as *Phyllosticta caryae*, or else is closely related.—(*Courtesy Biol. Abs.*)

Gardenia canker, H. N. Hansen and J. T. Barrett (*Mycologia*, *30* (*1938*), *No. 1*, *pp. 15–19, fig. 1*).—In this contribution from the University of California, *Phomopsis gardeniae* n. sp. is described as causing a definite canker and gall disease of *Gardenia jasminoides*. The fungus is apparently confined to a single host but with a rather wide distribution.

Additional studies concerning the rust of iris, Puccinia iridis, E. B. Mains (*Phytopathology*, *28* (*1938*), *No. 1*, *pp. 67–71*).—In *P. iridis*, a third race, *californica*, is distinguished. To it the differential strains of *Iris fulva* and *I. foliosa* are resistant, and the bearded varieties Leonato and Santa Fe are very susceptible. Previous studies of the races *septentrionalis* and *australis* had shown that bearded varieties were highly resistant to these races. Tables show the reaction of various species and varieties to the races *californica* and *septentrionalis*. Of the Spanish and Dutch iris varieties, Cajanus, David Bliss, Imperator, King of Blues, and Wedgewood proved outstanding for resistance to both races last named.

Mint anthracnose, R. C. Baines (*Phytopathology*, *28* (*1938*), *No. 2*, *pp. 103–113, figs. 4*).—In this contribution from the Indiana Experiment Station, anthracnose due to *Sphaceloma menthae* is reported on peppermint and spearmint in that State. Severe infection induces defoliation and a blighting of young stems and stolons and apparently causes significant losses. The disease was produced by artificial inoculations on white [illegible]

black (*M. piperita vulgaris*), and state (*M. piperita*) peppermint, common and Scotch spearmint (*M. spicata*), and Japanese mint (*M. arvensis piperascens*). In the necrotic tissue the mycelium is largely intercellular and sparsely distributed. The unicellular conidia are sessile on a superficial stroma. On malt extract, potato dextrose, and Leonian's agar media the fungus grows slowly and produces a brown heaped type of colony. Cultures grew well at 14°–28° C. on media adjusted to pH 3.6–8.2, and 21°–26.8° appeared most favorable for infection and disease development. The fungus overwinters on infected mint debris and is introduced into new fields on infected plants.

Effect of Endothia parasitica on conduction, W. C. Bramble (*Amer. Jour. Bot., 25 (1938), No. 1, pp. 61–65, figs. 2*).—In infected chestnut stems complete stoppage of water was shown to occur prior to the death of the leaves, this stoppage being found only in parts of stems bearing *E. parasitica* bark lesions. The most probable direct cause of this stoppage was found to be an abnormal formation of tyloses in the sapwood. These protrude into the conducting elements, thus blocking the passage of water and appearing to be the chief factor in the wilting and drying of the leaves.

Failure of Dasyscypha willkommii and related large-spore species to parasitize Douglas fir, G. G. Hahn and T. T. Ayers (*Phytopathology, 28 (1938), No. 1, pp. 50–57, fig. 1*).—On the basis of artificial inoculations and field observations, it was demonstrated that the larch-canker fungus is unable to parasitize the blue form of Douglas fir (*Pseudotsuga taxifolia*) or to grow on it as a saprophyte in the United States. Furthermore, no direct evidence was found that this organism parasitizes Douglas fir in Europe.

Two other large-spored species (*D. calycina*—not *Peziza calycina* Schum.), introduced into North America probably at the same time as the larch-canker organism, and *D. oblongospora*, collected in Michigan, eastward, and in eastern Canada, were found fruiting a few times on dead branches of Douglas fir trees adjacent to cankered larches in the area where *D. willkommii* was first discovered on imported larch. These two saprophytes were inoculated successfully on dying tissues of Douglas fir, but not on its living, healthy tissue. On these artificial infections *D. calycina* and *D. oblongospora* produced apothecia with the same morphological characters as under natural conditions.

Another member of this same group, the native *D. occidentalis*, has not been found growing either saprophytically or parasitically on Douglas fir, in nature or in inoculations. This fungus has been collected frequently on western larch (*Larix occidentalis*) in the Pacific Northwest and on certain conifers in the eastern United States.

A new disturbance of red pine, J. A. Jump (*Science, 87 (1938), No. 2250, pp. 138, 139*).—In New York State representative plats from approximately 800 acres of *Pinus resinosa* (red or Norway pine) ranging in age from 5 to 25 yr. have shown forking in 68–94 percent of the trees due to an extraseasonal growth of the lateral buds beginning in June or July of the year that they are set. The affected trees seldom, if ever, remain permanently forked. The preliminary evidence at hand strongly suggests a fungus origin.

Gall development on Pinus sylvestris attacked by the Woodgate Peridermium, and morphology of the parasite, R. P. True (*Phytopathology, 28 (1938), No. 1, pp. 24–49, pls. 3, figs. 6*).—The results of a detailed anatomical and histological study of the development of stem galls following infection by the Woodgate rust, a *Peridermium*, are presented. Observations were also made on the physiology of the galls (including ash analyses) and the morphology and life cycle of the fungus, a short-cycle gall rust having pycnia and reinfecting aeciospores as the only known spore forms. The anatomy of the galls is similar

to descriptions given of those due to *Cronartium quercuum*. Pycnia of this *Peridermium* were first found and are first reported in this study. The variety of early response shown by susceptible trees to infection and subsequent invasion suggests the possible existence of more than one physiologic race.

An example of the ability of Ribes lacustre to intensify Cronartium ribicola on Pinus monticola, J. L. Mielke (*Jour. Agr. Res.* [*U. S.*], *55* (*1937*), *No. 12, pp. 873–882, figs. 2*).—The abundance, distribution, and relative susceptibility to *C. ribicola* of four *Ribes* species make them especially important for its control in the commercial range of western white pine centering in northern Idaho. Numerically, the most prominent species is *R. lacustre*, which is relatively very low both in susceptibility and in telial production. Because of this reaction to blister rust, it has been believed relatively innocuous. However, the investigations on a 45-acre plat in British Columbia strongly indicate that this *Ribes* is capable of causing severe and rapid damage to associated *P. monticola*.

Life histories of two leaf-inhabiting fungi on sycamore, F. A. Wolf (*Mycologia, 30* (*1938*), *No. 1, pp. 54–63, figs. 14*).—Two conidial fungi, *Cercospora platanifolia* and *Stigmina platani*, occur together on the foliage of *Platanus occidentalis*, causing a blight involving severe defoliation. During the fall spermogonia and perithecial primordia are initiated concurrently on fallen leaves. After about two months spermatia cease to form, and by the following spring the perithecial stages are mature. The perfect stage of *C. platanifolia* is shown to be *Mycosphaerella platanifolia* and that of *S. platani* to be *M. stigmina-platani* n. sp. All are illustrated.

Crown gall on Taxus baccata, C. O. Smith (*Phytopathology, 28* (*1938*), *No. 2, pp. 153–155, fig. 1*).—This contribution from the Citrus Experiment Station, Riverside, Calif., reports about 70 percent infection on *T. baccata erecta* following inoculation with strains of *Pseudomonas tumefaciens* [=*Phytomonas tumefaciens*] isolated from *Prunus persica* and *Libocedrus decurrens*. The galls were somewhat smaller than those usually produced on other susceptible hosts. Under similar conditions, inoculations on *Podocarpus elongata* and *Cephalotaxus fortunei* (Taxaceae) failed.

Reduction of soil populations of the root-knot nematode during decomposition of organic matter, M. B. Linford, F. Yap, and J. M. Oliveira (*Soil Sci., 45* (*1938*), *No. 2, pp. 127–141, figs. 2*).—The decomposition of large amounts of organic matter in the soil was associated significantly with reductions in numbers of *Heterodera marioni* galls on the roots of indicator cowpeas. When indicator plants were planted after 1, 2, 3, 4, and 5 mo. of decomposition, the fewest galls developed after the shortest period and the most after 5 mo., indicating early reduction in the larval population and also demonstrating the action during decomposition of some factor other than the death of the larvae. Decomposition was consistently followed by increases in saprophagous and microphagous free-living and in predacious nematodes (dorylaims), and fungus-sucking species also increased in some of the tests.

Support was given to the theory that decomposition results in greatly increasing the nematodes in the soil, these in turn supporting the building up of large populations of plant and animal forms destructive to nematodes—nema-capturing fungi, nontrapping fungus parasites, and predacious nematodes and mites. Pineapples planted after decomposition (and growth of indicator cowpeas in one test) grew much better than in control soil—apparently due to reduced nematode injury, and with one exception cowpea growth was also superior in soil following decomposition. Local testing of various economic plants is advised before practical application of these results.

Twenty-three literature references are given.

ECONOMIC ZOOLOGY—ENTOMOLOGY

[Work in zoological sciences by the Cornell Station] (*[New York] Cornell Sta. Rpt. 1937, pp. 117–123*).—The report for the year 1937 (E. S. R., 76, p. 820) consists of historical accounts of the work in entomology, zoology, limnology, apiculture, and parasitology and medical entomology.

Wildlife Review, [October 1937 and February and March 1938] (*U. S. Dept. Agr., Bur. Biol. Survey, Wildlife Rev. Nos. 10 (1937), pp. 35; 11 (1938), pp. 37; 12, pp. 45; 13, pp. 34*).—A continuation of this series (E. S. R., 77, p. 653).

Silver fox pelt prices as affected by time of pelting, sex, and age, C. E. Kellogg (*U. S. Dept. Agr. Circ. 460 (1937), pp. 28, pls. 2, figs. 7*).—Report is made of a critical study of the auction prices of 10,689 of the more than 14,000 mature and pup silver fox pelts that were produced upon ranches in Wisconsin and Michigan in 1935 under similar conditions of breeding, feeding, and climate. The details are given in 10 tables.

Drowning as a cause of mortality in muskrats, P. L. Errington (*Jour. Mammal., 18 (1937), No. 4, pp. 497–500*).—Contributing from the Iowa Experiment Station, observations of drowning of muskrats (*Ondatra* spp.) in environments having rather stable water levels, made in connection with recent field studies on two marshes of about 400 and 450 acres, respectively, in that State, are reported.

The bird: Anatomy, physiology, appearance, and adaptation, II, F. Groebbels (*Der Vogel: Bau, Funktion, Lebenserscheinung, Einpassung, II. Berlin: Borntraeger Bros., 1937, vol. 2, pp. XVI+547, figs. 141*).—A continuation of the work previously noted (E. S. R., 69, p. 381), in which sex and reproduction are taken up.

Bird migration: A short account, A. Landsborough Thomson (*London: H. F. & G. Witherby, 1936, pp. 224, pls. [6], figs. 10*).—Following a brief introduction, some aspects of migration are considered in part 2, general features in part 3, and theories in part 4.

Goose nesting studies on Bear River Migratory Waterfowl Refuge, C. S. Williams and W. H. Marshall (*Jour. Wildlife Mangt., 1 (1937), No. 3–4, pp. 77–86, pls. 3, figs. 4*).—Management practices found of value as they relate to Canada goose (*Branta canadensis*) nesting at the Bear River Migratory Waterfowl Refuge in Utah are reported.

The birds of tropical west Africa, with special reference to those of the Gambia, Sierra Leone, the Gold Coast, and Nigeria, IV, D. A. Bannerman (*London: Crown Agents for Colonies, 1936, vol. 4, pp. XL+459, pls. [15], figs. 117*).—This fourth volume of the work previously noted (E. S. R., 71, p. 503) treats of the first eight families of the Passeriformes, the final order to be dealt with. It includes a large attached table of classification of the Passeriformes and an attached colored map of Gambia. An illustrated key to that part of the Passeriformes of tropical west Africa dealt with in this volume is included. Many of the species are illustrated in the 14 colored plates, others in text figures.

Experimental observations on spawning, larval development, and setting in the Olympia oyster (Ostrea lurida), A. E. Hopkins (*Bul. Bur. Fisheries [U. S.], 48 (1937), No. 23, pp. 439–503, pls. 4, figs. 36*).—Experimental observations are here reported, accompanied by a list of 43 references to the literature cited.

Hübner: A bibliographical and systematic account of the entomological works of Jacob Hübner and of the supplements thereto by Carl Geyer, Gottfried Franz von Frölich, and Gottlieb August Wilhelm Herrich-

Schäffer, I, II, F. Hemming (*London: Roy. Ent. Soc. London, 1937, vols. 1, pp. XXXIV+605, pl. 1; 2, pp. [XI]+274*).—The author's findings in his investigation of the dates of publication of the works of Hübner (1761–1826), based upon first-hand examination of all sources of information, including surviving manuscripts both of Hübner and Geyer (his successor), which till now have never been available for critical study, have made it possible to determine with precision the date of publication of almost every sheet of text and plate published by Hübner and by Geyer relating to the very large number of generic and specific names proposed by Hübner in his various works. It is pointed out that this has resulted in the disappearance of the last important obstacle to the stabilization of the nomenclature of the Lepidoptera, and that to a less extent it is of importance also for the stabilization of the nomenclature of other branches of the animal kingdom. The work includes (vol. 2, pp. 144–270) an alphabetical list of the generic names employed in the writings and supplements thereto, with references to the dates on which and to the works in which each name was so employed.

The insects, I, II, P. A. Robert (*Les Insectes, I, II. Neuchâtel: Delachaux & Niestlé, 1936, vol. 1, pp. XI+189, pls. 32, figs. [76]; 1937, vol. 2, pp. 270, pls. 32, figs. 76*).—A general account of insects, presented by orders, many of which are illustrated by colored plates.

A contribution to a study of the cytology of the blood of certain insects, together with general considerations, M. Rooseboom (*Contribution à l'étude de la cytologie du sang de certains insectes, avec quelques considérations générales. Proefschr., Rijksuniv. Leiden, 1937, pp. [7]+135, pls. 3, figs. 5; Dutch abs., pp. 129–135*).—This contribution is presented with a nine-page list of references to the literature.

Population problems of social insects, F. S. Bodenheimer (*Biol. Rev. Cambridge Phil. Soc., 12 (1937), No. 4, pp. 393–430, figs. 10*).—This contribution is considered under the headings of termites, ants, social wasps, bumblebees, and social bees. A list of 116 references to the literature is included.

Entomology in relation to conservation, F. C. Bishopp (*Jour. Econ. Ent., 31 (1938), No. 1, pp. 1–11*).—This contribution was presented as the presidential address at the annual meeting of the American Association of Economic Entomologists held at Indianapolis, Ind., in December 1937.

[Symposium of the relationship between insects and plant diseases] (*Jour. Econ. Ent., 31 (1938), No. 1, pp. 11–44*).—Contributions to this symposium, held at Indianapolis, Ind., in December 1937, include the following: Insects in Relation to Diseases of Truck Crops, by A. A. Granovsky (Minn. Expt. Sta.), with a list of 31 references to the literature and a discussion by D. M. DeLong (pp. 11–19); Insects in Relation to Diseases of Fruit Trees and Small Fruits, by L. O. Kunkel, with a discussion by E. M. Searls (pp. 20–23); Insects in Relation to Diseases of Shade and Forest Trees, by J. G. Leach (pp. 23, 24) (Minn.); Insects in Relation to Diseases of Cereal and Forage Crops, by F. W. Poos, with a list of 82 references to the literature and a discussion by J. W. Ingram (pp. 24–39); and Problems Involved in Control of Plant Diseases and Insects, by N. E. Stevens (pp. 39–44).

A survey of insect injury to tobacco grown for flue curing, W. A. Shands, N. Allen, and J. U. Gilmore (*Jour. Econ. Ent., 31 (1938), No. 1, pp. 116, 117, figs. 2*).—The results of a field survey of the distribution and degree of insect injury to leaves of tobacco grown for flue curing in South Carolina, North Carolina, and Virginia, made during August and September 1935, are summarized in table form accompanied by descriptive notes.

Scientific contributions, E. P. FELT and S. W. BROMLEY (*Bartlett Tree Res. Labs. Bul. 2 (1937), pp. 10–21, figs. 7*).—Contributions relating to economic insects and their control not previously noted are as follows: Fall Cankerworm (*Alsophila pometaria* Harris) (pp. 10–13), White Pine Tip Moth *Eucosma gloriola* Heinrich (pp. 13, 14), The Maple Nepticula *Nepticula sericopeza* Zeller (pp. 14, 15), Pine Needle Midge *Itonida pinifoliae* Felt (p. 15), Elm Bud Midge *Dasyneura ulmea* Felt (p. 16), Feeding on Elm by Boring Beetles [Elm Borer, Red Elm Bark Weevil, and the Native Elm Bark Beetle] (pp. 16–18), Scotch Pine Weevil *Hylobius radicis* Buchanan (pp. 18, 19), A New Ambrosia Beetle (*Xyleborus germanus* Blandf.) in America (p. 20), Holly Scale (*Asterolecanium*) (p. 20), and Maple Bladder Gall *Phyllocoptes quadripes* Shim. (p. 21).

Insect infestation of stored products, H. HAYHURST (*Ann. Appl. Biol., 24 (1937), No. 4, pp. 797–807, pls. 2,*).—A survey of insects made by the author during the past 10 yr. is reported upon in systematic order.

Our bibliophagic insects and the fight against the havoc they cause, G. DEL CID (*Arxius [Barcelona], n. ser., 2 (1936), No. 4, pp. 555–588, figs. 15; Span., pp. 555–567; Eng., pp. 574–588*).—Insect enemies of books are reported upon in this contribution, presented with a list of 25 references to the literature.

The insecticidal properties of some east African plants, III, pt. 2, IV, pt. 3, R. R. LE G. WORSLEY (*Ann. Appl. Biol., 24 (1937), No. 3, pp. 651–658, 659–664, fig. 1*).—These contributions on *Mundulea suberosa* Benth. are in continuation of the series previously noted (E. S. R., 76, p. 360). Part 2 deals with chemical constituents, and part 3 with the variability of samples. In studies of *M. suberosa* a series of substances has been isolated from a sample of bark consisting of rotenone, white crystals which are probably a mixture of *l*-deguelin and tephrosin, yellow crystals which are probably dehydrorotenone, glucosides, and alkaloids. Only the rotenone is appreciably toxic to aphids.

The translocation of derris constituents in bean plants, R. A. FULTON and H. C. MASON (*Jour. Agr. Res. [U. S.], 55 (1937), No. 12, pp. 903–907*).—In the course of an investigation conducted, a definite retarding in the feeding of the Mexican bean beetle on the new growth of bean plants that had been treated with derris powder was observed. "First, second, and third trifoliate leaves, formed after the first pair of true leaves had been treated, were found to be less palatable to bean beetle larvae than similar leaves from untreated plants. Extracts prepared from first, second, and third trifoliate leaves, formed after the application of derris powder to the first pair of true leaves, caused 100-percent mortality to goldfish. Extracts prepared from first, second, and third trifoliate leaves from untreated plants were not toxic. A water extract prepared by macerating new growth of bean plants that had been treated with derris was fatal to goldfish. In one case, where a large quantity of new-growth material was available, a crystalline substance resembling rotenone was isolated. The material when purified had a melting point of 163.5° C., gave the characteristic color with the Gross-Smith method, and the blue color test of Durham. One mg of this substance in 650 cc of water at 26.7° killed three goldfish in an average of 77 min."

The experiments are considered to have demonstrated that derris constituents are translocated from the outer surfaces of leaves to first, second, and third trifoliate leaves formed after the application of derris powder in water suspension to the first true leaves and stems of bean plants.

Rotenone, its preparation and uses in applied entomology [trans. title], E. TILEMANS (*Bul. Inst. Agron. et Stas. Rech. Gembloux, 5 (1936), No. 2, pp. 186–205; Dutch, Ger., Eng. abs., pp. 203–205*).—This contribution is presented with a list of 114 references to the literature.

Quantitative injection and effects of nicotine in insects, N. T. McIndoo (*Jour. Agr. Res.* [*U. S.*], *55* (*1937*), *No. 12, pp. 909–921, figs. 4*).—The study reported deals with the improvement of apparatus for the quantitative injection of solutions into insects, the comparative susceptibility of various species to nicotine, the effect of age of insects on susceptibility, the difference between the toxicity of nicotine and that of nicotine sulfate, and other toxicological problems. In order to inject minimum quantitative doses of nicotine into insects, a micrometer syringe and other devices to accompany it were used for the first time for administering insecticides. With a minimum dose of 1.24 mm^3 the error never exceeded 4 percent and was usually less.

The comparative susceptibility to nicotine of various species and the sexes has been found to be of the following descending order; *Lucilia sericata* Meig. male, *Lucilia* female, codling moth larva, *Calliphora erythrocephala* Meig. male and female, silkworm, southern armyworm, and *Phormia regina* Meig. larva. The *Lucilia* male flies were nine times as susceptible as the *Phormia* larvae. In general, the susceptibility of the larval forms was about half that of the imaginal forms.

Nicotine vaporizing equipment for field and orchard use, R. H. Smith (*Jour. Econ. Ent., 31* (*1938*), *No. 1, pp. 60–64, figs. 2*).—A description is given of an equipment for nicotine vaporizing (E. S. R., 73, p. 345) that has been developed for field and orchard use. In the words of the author, "it should not be inferred that the vaporizer described is a preferred design or that it is notably practical and efficient. On the contrary it has some obvious shortcomings, the most important being its complexity of parts and relatively high cost. These can probably be largely overcome by employing a heated coil to vaporize the nicotine, thereby dispensing with the air compressor and the atomizing mechanism. The necessity of providing a flow of heated air with which to convey the vapor to the plants and diffuse it among the plants will vary considerably with different conditions of insect infestation. Investigation may show that this feature may be dispensed with in most control work."

Wetting properties of triethanolamine oleate, H. L. Cupples (*Jour. Econ. Ent., 31* (*1938*), *No. 1, pp. 68–70, figs. 2*).—It has been found that "at concentrations from 0.01 to 1 percent oleic acid the wetting power of aqueous triethanolamine-oleic acid mixtures increases with increase of the ratio of triethanolamine to oleic acid, at least up to the mol ratio 6. At moderately high concentrations, such as 1 percent oleic acid, there is no abrupt change in wetting properties in the vicinity of the ratio 1 (point of equivalence), such as occurs when the base is a caustic alkali. Solutions of triethanolamine oleate readily produce a stable foam, and the material has a number of desirable properties which make it an efficient wetting agent."

Laboratory studies of methyl bromide as an insect fumigant, F. W. Fisk and H. H. Shepard (*Jour. Econ. Ent., 31* (*1938*), *No. 1, pp. 79–84*).—In work at the Minnesota Experiment Station it was found that methyl bromide, which has been in use as a fire-extinguishing chemical and has a lower boiling point (4.5° C.) than other fumigants, is a promising new fumigant. "In toxicity to insects methyl bromide compares favorably with hydrocyanic acid, chloropicrin, and ethylene oxide. The eggs of *Tribolium confusum* are considerably less resistant to this compound than are the adults.

"The relation of absorption to the boiling point of the fumigant is discussed. Absorption ratios are given for most of the common fumigants. The influence of various reduced pressures upon the toxicity of methyl bromide and their relation to the presence of absorptive materials, such as raisins, wheat, and flour, were investigated. The toxicity of methyl bromide appears to be affected by

temperature about as much as carbon disulfide is and considerably less so than is chloropicrin. In general, methyl bromide is definitely more effective when it is in the presence of moisture. Seed germination is not affected noticeably by methyl bromide treatment. Corn, wheat, oats, barley, beans, and field peas were tested."

A list is given of 13 references to the literature.

Methyl bromide: Its expectancy as a fumigant, D. B. Mackie (*Jour. Econ. Ent., 31 (1938), No. 1, pp. 70–79*).—In work conducted in California the vapors of methyl bromide have been found fatally toxic to species of a large group of insects and other forms of animal life. On the other hand, many forms of plant life, either in active or dormant stage, can accommodate themselves to its vapors for periods that are completely lethal to the parasites they support.

"The stability of its vapors under such physical conditions as moisture, temperature, and pressure adds materially to the list of products that may be successfully treated. Its noninflammability at all concentrations in which it might be used as a fumigant permits its use under conditions where this property is a dominant factor.

"Lack of distinctive odor at doses that are toxic to the higher forms of animal life makes its action more or less insidious, particularly where exposure is protracted, creating a natural presumption that in the hands of a person unfamiliar with its properties its use may expose the operator to considerable risk. It may be taken for granted that this lack of distinctive odor can and will be compensated for by the addition of some warning compound, such as a lachrymator, that will act as a repellent to individuals in the danger area.

"The mechanics of equipment for dispensing methyl bromide present no undue problem and in most cases are either solved or in the way of solution. In all fairness to this compound, it should be stated that publicity given methyl bromide, both before and in connection with the recent and only fatality, has resulted in the widespread dissemination of much information that is either erroneous or misleading. Those considering its use will do well to make a comparison of its properties with those of other fumigants now offered for the control of insects and other animal pests. It is the writer's opinion that its virtues vastly transcend its shortcomings."

Studies in soil fumigation, I, II (*Ann. Appl. Biol., 24 (1937), No. 4, pp. 883–894, figs. 2; pp. 895–910, figs. 5*).—The results of preliminary tests of possible methods of investigating the factors controlling the distribution of fumigant vapor in soil are described by M. F. Bywaters and A. G. Pollard in the first contribution. In the second, by J. C. Higgins and A. G. Pollard, the distribution of carbon disulfide in soil fumigant under various conditions is considered under the headings of the determination of carbon disulfide in fumigated soil, preliminary observations of single injections in field soils, single injection tests in the box fumigatorium, multiple injection tests in field soil, and box experiments with multiple injections.

[Notes on economic insects and their control] (*Jour. Econ. Ent., 31 (1938), No. 1, pp. 125–130*).—The contributions presented (E. S. R., 78, p. 657) are: A New Chrysanthemum Pest, *Vanduzea segmentata* (Fowler), by H. L. Dozier (p. 125); Postfumigation Effects on the Cigarette Beetle in Tobacco Bales, by W. D. Reed and E. M. Livingstone (pp. 125, 126); Pest Problems on Chrysanthemums Increased by the Practice of Shading, by F. F. Smith (pp. 126, 127); Effect of Insect Attack on the Rotenone Content of Stored Cubé Root, by H. A. Jones (p. 127); Life History and Control of *Phthia picta* Drury on Tomatoes, by S. E. Jones (pp. 127, 128) (Tex. Expt. Sta.); Horned Toads in Ant [*Pogonomyrmex occidentalis*] Control, by G. F. Knowlton (p. 128) (Utah);

Observations on Diptera Breeding in Tomatoes, by R. H. Nelson (pp. 128, 129); *Trichogramma evanescens* Westwood, a Parasite of *Melissopus latiferreanus* Wlshn., by B. G. Thompson (p. 129) (Oreg.): Swarms of the Common Pentatomid *Thyanta custator* (F.) in Iowa, by C. N. Ainslie (p. 130); and Scattering Grasshopper Bait From an Airplane, by F. E. Whitehead (p. 130) (Okla.).

[Work in entomology by the Maine Station] (*Maine Sta. Bul. 387 (1937), pp. 157–161, 171–178, 181–183, 203–206, 241–243, 245, 246, 256, 257, figs. 5*).—Included in the work referred to (E. S. R., 77, p. 66) are pea aphid investigations, by J. H. Hawkins; insects affecting the apple crop, particularly the gypsy moth, the apple maggot, the plum curculio, and the apple seed chalcid, by F. H. Lathrop, and canning crops, including the Mexican bean beetle, by Hawkins; control of the striped cucumber beetle, also by Hawkins; insects in relation to the transmission of virus diseases and control of flea beetles on potatoes, both by G. W. Simpson; blueberry insects, including the blueberry maggot, the blueberry thrips *Frankliniella vaccinii* Morg., and the blueberry flea beetle *Haltica torquata* LeC., by Lathrop; and wireworm control in relation to potato growing, by Hawkins.

[Work in entomology by the New Mexico Station] (*New Mexico Sta. Rpt. 1937, pp. 33–44, 51, 53, 54, figs. 5*).—The activities of the year referred to (E. S. R., 77, p. 215) include insecticide and trapping investigations with the codling moth, namely: (1) investigations concerning the bacteriology and chemistry of fermenting cane sirup solutions, (2) chemistry and attractancy of aromatic chemicals in pure form, (3) improvements in trap design and manipulation, (4) effect of weather on trap efficiency, and (5) comparisons of insecticides used as supplements for lead arsenate in summer cover sprays; insecticide control measures for the onion thrips on onions; and determination of spray residue on apples and lettuce.

[Work in economic entomology by the Texas Station] (*Texas Sta. Rpt. 1936, pp. 45–56, 150–156, 179–181, 215, 216, 274, 282–286, 287, 297, 298, 325–327*).—The work of the year reported upon (E. S. R., 76, p. 501) includes that with the sorghum webworm, by H. J. Reinhard; bollweevil hibernation, in cooperation with the U. S. D. A. Bureau of Entomology and Plant Quarantine, by Reinhard, S. E. Jones, and R. W. Moreland; cotton flea hopper, including migration by J. C. Gaines and F. L. Thomas, control by T. McGregor, F. F. Bibby, and S. W. Clark, hibernation, and egg parasitism by Reinhard; pink bollworm, by A. J. Chapman, and bollworm, by R. K. Fletcher and Moreland, both in cooperation with the U. S. D. A. Bureau of Entomology and Plant Quarantine; thrips on cotton (principally the flower thrips), by M. J. Janes; the cabbage looper and *Platynota rostrana* Walk. as minor pests of cotton, by Gaines; sulfur as an insecticide, by Thomas et al.; pecan insect investigations, by S. W. Bilsing; studies on the devil's shoestring (*Tephrosia virginiana*) as an insecticide, in cooperation with the U. S. D. A. Bureau of Plant Industry, by V. A. Little and G. A. Russell; the turnip aphid, the cabbage looper, the potato leafhopper, and the banded cucumber beetle, by J. N. Roney; apiary inspection, 1935–36, by C. E. Heard and C. J. Burgin; activities of bees, by H. B. Parks; adaptability of native plants, queen rearing, and bee production, all by Parks and A. H. Alex; horsemint for honey and oil productiou, by Parks and V. L. Cory; relationship of honey plants to insects, by Parks; at the Tyler substation cotton insects, rose insects, and peach tree insects, all by W. L. Owen, Jr.; at the Temple Substation the vegetable weevil on potato and bean plants and miscellaneous insects, both by C. H. Rogers; at the Sonora Substtation screwworm and fly repellents, by W. H. Damerson and O. G. Babcock, and, in cooperation with the U. S. D. A. Bureau of Entomology and Plant Quarantine,

goat louse and sheep louse investigations, the sheep botfly in sheep and goats, the screwworm, and winter ticks, all by Babcock; at the Weslaco Substation citrus rust mites and red spiders (*Anychus clarki*) by Clark and Thomas, parasites of scale insects by Clark, parasites of the pink bollworm by Clark and Chapman, and truck crop insect investigations and miscellaneous insects by Clark; and at the Winter Haven Substation the beet leafhopper on spinach by Jones, Janes, and Fletcher, eggplant yellows (possibly transmitted by insects), the onion thrips, the European corn borer, and *Phyllophaga cribrosa* on spinach, all by Jones and Janes, control of *Phthia picta* on tomatoes by Jones, and *Paratrioza cockerelli* (Sulc.) by Janes.

Report on the entomological division for the year 1935, F. A. Squire (*Brit. Guiana Dept. Agr., Div. Rpts., 1935, pp. 103–108*).—The occurrence of the more important insects and the work of the year are reported upon (E. S. R., 72, p. 808).

Insects of Samoa and other Samoan terrestrial Arthropoda (*London: Brit. Mus. (Nat. Hist.), 1929, pt. 8, fasc. 2, pp. 29–78, figs. 83; 1930, pt. 9, fasc. 1, pp. 31, pls. 6, figs. 2; 1935, pt. 9, fasc. 2, pp. 33–104, fasc. 3, pp. 105–159*).—A continuation of this contribution (E. S. R., 62, p. 852), presented as follows: VIII, Terrestrial Arthropoda Other Than Insects—fasc. 2, Myriapods (Myriopoda) [trans. title], by C. Attems (pp. 29–34), and Arneids (Araneida) [trans. title], by L. Berland (pp. 35–78), and IX, fasc. 1, Description of the Environment (pp. 31) and fasc. 2, Summary (pp. 33–104), both by P. A. Buxton, and fasc. 3, Addenda and Corrigenda and Index (pp. 105–159).

Effectiveness of fluorine compounds as food poisons for the firebrat, E. J. Seiferle, J. A. Adams, C. M. Nagel, and W. C. Ho (*Jour. Econ. Ent., 31 (1938), No. 1, pp. 55–60, figs. 2*).—Report is made in this contribution from the Iowa Experiment Station of studies of the effects of four fluorine compounds on the firebrat, a thysanuran household pest.

"Each compound was mixed with a preferred food of the firebrat in 4-, 8-, and 12-percent concentrations, the baits being continually available to the insects. Median lethal times are in the following order: Sodium fluoride< sodium fluosilicate<barium fluosilicate<sodium fluoaluminate. All concentrations of these compounds produce 100 percent mortality; sodium fluoride, sodium fluosilicate, and barium fluosilicate in about the same time, and sodium fluoaluminate in a somewhat longer time.

"Sodium fluoride killed 27 to 53 percent of the insects in 24 hr., but the other compounds killed only a few insects in this period. Experiments made on the 12 percent concentrations in which the bait was taken away from the insects after 24 hr. indicate that the delayed mortalities with the two fluosilicates were due to their slower lethal action, while that of sodium fluoaluminate is probably due either to repellence or to high lethal dosage."

The injurious grasshoppers and other Orthoptera in Bulgaria, P. Chorbadsiev (Chorbadjieff) (*[Bulgaria] Min. Zemedel. i Durs. Imoti [Trud.] (Min. Agr. and Natl. Domains [Proc.]), No. 61 (1936), pp. 80, figs. 30; Eng. abs., pp. 75, 76*).—A summary of information on the Orthoptera of Bulgaria, with control measures which have proved to be most effective.

Resistance of sorghums to the chinch bug, R. O. Snelling, R. H. Painter, J. H. Parker, and W. M. Osborn (*U. S. Dept. Agr., Tech. Bul. 585 (1937), pp. 56, pl. 1, figs. 15*).—Data gathered at Manhattan, Kans., during a period of more than 15 yr. and during a 5-yr. period at Lawton, Okla., in the course of work conducted by the U. S. Department of Agriculture and the Kansas Experiment Station, cooperating, here reported upon, indicate the possibility of reducing injury by chinch bugs to sorghums through host resistance. The chinch bug

reaction of most of the important and standard varieties of sorghum was determined, it having been found in general that the milos are very susceptible, the feteritas susceptible, and the kafirs and sorgos rather resistant. Most of the sorgos are slightly more resistant than the kafirs, but others are susceptible.

Earlier reports of work on the subject presented by the authors include the following: By Snelling (E. S. R., 76, p. 70), Snelling and Dahms (E. S. R., 78, p. 75) (Okla. Expt. Sta.), Painter (E. S. R., 60, p. 250), Painter, Snelling, and Brunson (E. S. R., 74, p. 518), and Parker and Painter (E. S. R., 68, p. 747).

The report is accompanied by a list of 70 references to the literature cited.

Inoculation of young cicada nymphs with spores of green muscardine disease, S. K. Katsura (*Jour. Econ. Ent., 31 (1938), No. 1, pp. 124, 125, fig. 1*).—The results of inoculations of nymphs of the periodical cicada, as they hatched out, with spores of the green muscardine fungus ***Metarrhizium anisopliae*** are briefly reported.

The hydrogen ion concentration and buffer value of the blood of larvae of Pieris rapae (L.) and Heliothis obsoleta (F.), R. Craig and J. R. Clark (*Jour. Econ. Ent., 31 (1938), No. 1, pp. 51–54, figs. 3*).—A knowledge of the pH and buffer value of insect blood being of value in interpreting the physiological action of insecticides, samples of larval blood of the imported cabbageworm and the corn earworm were titrated and both titration and buffer value curves drawn. Capillary glass electrodes capable of handling a volume of 0.05 cc or less were constructed, and the potential differences were measured with a modified Du Bridge and Hart single thermionic tube electrometer circuit. There was found to be a low but effective buffer system present, probably composed of several salts and proteins, about the pH range of from 4 to 7.5. Both the normal pH and the buffer value of the larval blood in the last instar were found to be greater than those of the preceding instar.

A list is given of 13 references to the literature cited.

The sorghum webworm (Celama sorghiella Riley), H. J. Reinhard (*Texas Sta. Bul. 559 (1938), pp. 35, figs. 3*).—This is a detailed report of a study of the biology of the sorghum webworm, the details being presented in eight tables, together with information on control and means of prevention. An account from another source has been noted (E. S. R., 78, p. 667).

The rearing records indicate that six complete generations or broods and a partial seventh are produced during a season in Texas, as compared to the three generations found by Haseman in investigations in Missouri (E. S. R., 69, p. 79). It is shown that the use of insecticides to control the pest is not practical, and that chief dependence must be placed on methods of crop management, of which clean-up practices after harvest and timely planting are perhaps the most important. Stubbles should be plowed under thoroughly during the winter and Johnson grass areas burned over to reduce the overwintering population of worms. Crops timed to mature by midseason are invariably injured the least. Although the sorghum webworm is attacked by four or five different parasites, these are not effective in preventing the development of injurious infestations.

A statistical study of sampling in field surveys of the fall population of the European corn borer, M. T. Meyers and L. H. Patch (*Jour. Agr. Res. [U. S.], 55 (1937), No. 11, pp. 849–871, figs. 3*).—In an analysis of the sampling variability in the study reported, the average number of European corn borer larvae per 100 cornstalks in fields over county-wide areas of Michigan, Ohio, Pennsylvania, and New York in 1931 and 1932 was determined from the product

of the number in 100 infested plants and the average number of borers per infested plant. The plant samples per field consisted of 25 consecutive plants from each quarter of the field to determine the number of infested plants, and a maximum of 10 infested plants was dissected to determine the average number of borers per infested plant. From 20 to 25 fields were examined in each of 66 counties.

At the levels of 19.5, 109, and 423 borers per 100 plants, the taking of two infestation samples instead of one sample reduced the total variance in the field slightly more, about one-third as much, and about one-thirtieth as much, respectively, as if two plants had been dissected instead of one plant. At the level of 8.88 borers per 100 plants, increasing the number of plants dissected from 1 to 5 within each field had nearly the same effect in reducing the variability of the estimates of the county means as increasing the number of 25-plant infestation samples from 1 to 4, and increasing both by these amounts at the same time was about twice as effective. As the levels of population of the counties increased, the reduction in the variability of the county means due to increasing the number of infestation samples decreased rapidly. The basic principles of survey sampling are discussed.

Corn borer (Pyrausta nubilalis Hb.) as corn and hemp pest in Bulgaria, V. I. Popov (Popoff) (*[Bulgaria] Min. Zemedĕl. i Durs. Imoti [Trud.] (Min. Agr. and Natl. Domains [Proc.]), No. 68 (1936), pp. 103, figs. 18; Eng. abs., pp. 89–97*).—A summary of information, presented with a list of 88 references to the literature, on the European corn borer in Bulgaria, where its host plants include corn, hemp, broomcorn millet, common hop, pepper, bean, rice, wormseed, pigweed, and thistle.

Some characteristics of Ephestia kühniella Z. reared under aseptic conditions, S. E. Jacobs and D. P. Raichoudhury (*Ann. Appl. Biol., 24 (1937), No. 3, pp. 632–650, pl. 1, fig. 1*).—The details of studies conducted are reported in five tables. In bacteriological and microscopic examinations of diseased larvae of the aseptically reared Mediterranean flour moth no infecting micro-organisms were discovered, and it was concluded that the disease is probably physiological.

Clothes moths and house moths: Their life-history, habits, and control, E. E. Austen and A. W. McKenny Hughes, rev. by A. W. McKenny Hughes and H. Stringer (*Brit. Mus. (Nat. Hist.), Econ. Ser. No. 14, 2. ed., rev., (1935), pp. 50, figs. 19*).—A revised edition of this account (E. S. R., 69, p. 391).

Clothes moths, E. A. Back (*U. S. Dept. Agr. Leaflet 145 (1938), pp. 8, figs. 5*).—A practical account of the webbing clothes moth and the casebearing clothes moth and means for their control.

Sugar-cane moth borer (Diatraea) investigations.—III, Report on Lixophaga campaign for 1936 and the status of the parasite in Antigua at the end of the year, H. E. Box (*Antigua, B. W. I.: Colon. Devlpmt. Fund, 1937, pp. [3]+21*).—Reporting further (E. S. R., 70, p. 506), the status of parasitism of the sugarcane borer by the tachinid *L. diatraea* at the end of the year 1936 is shown to have been incomparably better than at any time since its introduction from Cuba in 1932. The details are presented in tables.

Toxicity of several stomach-poison insecticides to four species of lepidopterous larvae, L. O. Ellisor and E. H. Floyd (*Jour. Econ. Ent., 31 (1938), No. 1, pp. 65–68*).—Contributing from the Louisiana Experiment Station the authors describe several changes in technic in the determination of minimum lethal doses by the single-leaf method of Hansberry and Richardson previously noted (E. S. R., 76, p. 503). "A sticker-spreader mixture for holding the dust particles to the foliage was used in some of the tests. A total of 11 m. l. d. was determined, representing four different stomach-poison insecticides and four

species of lepidopterous larvae [imported cabbageworm, cabbage looper, fall webworm, and velvetbean caterpillar]. It was shown that there was a marked difference in the susceptibility of the various species of insects to the several poisons employed, and also that a great difference existed in the toxicity of the several poisons to a given species; e. g., the minimum lethal dose of sodium fluoaluminate was 0.08 mg/g for *Ascia rapae* and 0.17 mg/g for *Anticarsia gemmatilis*, whereas acid lead arsenate exhibited about the same toxicity to both species. The minimum lethal dose of calcium arsenate varied from 0.11 mg/g for *A. gemmatilis* to about 2 mg/g for *Hyphantria cunea*."

Conditions affecting mosquito breeding, with special reference to Aedes thibaulti Dyar and Knab (Diptera, Culicidae), S. E. SHIELDS and J. B. LACKEY (*Jour. Econ. Ent., 31 (1938), No. 1, pp. 95–102, figs. 4*).—This is a contribution from the Health Section of the Tennessee Valley Authority, Wilson Dam, Alabama.

Mosquito transmission of avian malaria parasites (Plasmodium circumflexum and P. cathemerium), C. M. HERMAN (*Amer. Jour. Hyg., 27 (1938), No. 2, pp. 345–350*).—Experiments involving attempts to transmit two species of *Plasmodium*, *P. circumflexum* and *P. cathemerium*, isolated from red-winged blackbirds (*Agelaius phoeniceus phoeniceus*) and cowbirds (*Molothrus ater ater*) on Cape Cod, Mass., by seven species of mosquitoes (the northern house mosquito, *Culex apicalis*, the saltmarsh mosquito, *Aëdes canadensis*, the brown saltmarsh mosquito, *A. vexans*, and *Theobaldia melaneura*) are reported. Successful transfers were obtained from bird to mosquito and from mosquito back to bird in the case of *P. circumflexum* isolated from both the red-winged blackbird and the cowbird by *T. melaneura* and *P. cathemerium*, also isolated from both of these two birds by the northern house mosquito and the saltmarsh mosquito.

Experiments with paris green and calcium arsenite as larvicides for culicine mosquitoes, W. V. KING and T. E. MCNEEL (*Jour. Econ. Ent., 31 (1938), No. 1, pp. 85, 86*).—This contribution reports briefly, without conclusions, upon preliminary field tests with paris green and calcium arsenite and autogiro experiments with paris green applied for the control of culicine mosquitoes.

The laboratory rearing of flesh flies and the relations between temperature, diet, and egg production, S. C. DORMAN, W. C. HALE, and W. M. HOSKINS (*Jour. Econ. Ent., 31 (1938), No. 1, pp. 44–51, fig. 1*).—A description is given of convenient and labor-saving apparatus and procedures which have been developed during the course of 8 years' experience in the rearing of *Lucilia sericata* in California. Fish heads for the larvae and water, sugar, and fish heads for the adults have been found to be cheap and nutritionally satisfactory as foods.

Data are given on the effect of temperature upon the duration of the various developmental stages and of the whole life cycle. The various stages, particularly the prepupal, may be effectively retarded by chilling. The developmental zero of egg formation as determined by extrapolation of the temperature-rate line was about 14° C. Carbohydrate has been found essential for continued life of the adult fly and protein for the growth of the ovaries. Casein, sodium or ammonium caseinate, blood albumin or Lemco's beef extract did not allow ovary development. The eggs of old flies are more sensitive to sterilizing agents such as Lysol than are the eggs of young flies.

The temperature-development curve of Lyperosia exigua de Meijere (Diptera, Muscidae) in relation to the probable distribution of this insect in Australia, J. DAVIDSON (*Austral. Jour. Expt. Biol. and Med. Sci., 15 (1937), No. 2, pp. 113–120*).—Observations of the blood-sucking "buffalo-fly" *L. exigua*, originally known from the Oriental region, are presented. It has spread into

the Australasian region and parts of China and is now widely distributed over northern Australia, where it is a serious pest of cattle.

The tsetse flies: Their morphology, biology, and control, F. Zumpt (*Die Tsetsefliegen: Ihre Erkennungsmerkmale, Lebensweise, und Bekämpfung. Jena: Gustav Fischer, 1936, pp. IV+149, pls. 15, figs. 121*).—This handbook, with descriptive accounts of 20 species of the genus *Glossina*, is accompanied by drawings and photographs illustrating their structure, habits, etc., and a 19-page list of references to the literature.

Some dipterous insects reared from narcissus bulbs, F. S. Blanton (*Jour. Econ. Ent., 31 (1938), No. 1, pp. 113–116, figs. 15*).—This contribution gives descriptions of and notes on species of Diptera that have been reared from narcissus bulbs. All of these except the narcissus bulb fly were reared from decayed bulbs and therefore are considered of little or no economic importance. A preliminary contribution on the lesser bulb flies *Eumerus tuberculatus* Rond., *E. strigatus* Fall., and *E. narcissi* Smith from Long Island has been noted (E. S. R., 69, p. 233).

New fruitflies of the genus Anastrepha (Diptera: Trypetidae) [trans. title], A. da Costa Lima (*Campo [Rio de Janeiro], 8 (1937), No. 90, pp. 34–38, figs. 21*).—Five species of fruitflies of the genus *Anastrepha* from Bahia are described as new.

How to control fleas, F. C. Bishopp (*U. S. Dept. Agr. Leaflet 152 (1937), pp. 4, figs. 4*).—A brief practical account.

Oviposition in certain Coleoptera, J. Dick (*Ann. Appl. Biol., 24 (1937), No. 4, pp. 762–796, figs. 19*).—A description is given of methods for satisfactory oviposition studies of four species of beetles, namely, the yellow mealworm, the confused flour beetle, the drug store weevil, and the hide beetle. Four types of oviposition cycle are recognized. The contribution is presented with a list of 61 references to the literature.

The effect of insecticides on a beneficial coccinellid, Hippodamia convergens Guer., G. W. Haug and A. Peterson (*Jour. Econ. Ent., 31 (1938), No. 1, pp. 87–92, figs. 3*).—This contribution reports upon general methods, methods with adults, eggs, and larvae, and insecticide results based entirely on indoor work in Ohio with the convergent ladybeetle. The results are considered to indicate what happens to coccinellids when the sprays reported upon are employed under field conditions.

"Of the insecticides tested phenothiazine and derris proved to be the most toxic to all stages of the coccinellid. Phenothiazine killed 95 to 100 percent of the adults, eggs, and larvae, and derris killed approximately 70 percent of the adults, 46 percent of the larvae, and 14 percent of the eggs. The egg mortality reported with derris is much greater, if the large number of larvae that died a short time after they hatched are included in the number of dead eggs. Black Leaf 40 and some of the arsenicals, particularly paris green and calcium arsenate, proved to be fairly toxic to adults, especially if thirsty adults were used or if adults were confined in sprayed cages with sprayed aphids. All other insecticides in the tests conducted produced an average kill of less than 25 percent and in many cases no kill. In general, the insecticides tested appeared to kill a higher percentage of adults than eggs or larvae."

Resistance of certain corn hybrids to attack of southern corn rootworm, J. H. Bigger, J. R. Holbert, W. P. Flint, and A. L. Lang (*Jour. Econ. Ent., 31 (1938), No. 1, pp. 102–107, figs. 5*).—Preliminary observations of the differential response of strains of corn to attack by the southern corn rootworm, made by the Illinois Experiment Station, the Illinois State Natural History Survey, and

the U. S. D. A. Bureau of Plant Industry, cooperating in 1927 and more extensively in 1935, are reported.

It was clearly shown that corn hybrids in general were more resistant than local open-pollinated varieties, some hybrids being more resistant than others. An important factor in the resistance of strains of corn to the southern corn rootworm is shown to be their ability to recover following damage by the insect. The relation of root pruning by this insect to root rots which follow this attack and resistance to this rotting by certain strains are other factors. Corn on soils in a high state of fertility will lodge more extensively than will corn on lower fertility levels.

Low temperature as a possible means of controlling the cigarette beetle in stored tobacco, M. C. Swingle (*U. S. Dept. Agr. Circ. 462 (1938), pp. 8, figs. 3*).—Investigations reported have shown that the cigarette beetle can be controlled by relatively short exposures to low temperature. "At 36° F. a 16-day exposure killed all stages, and at 25° a 7-day exposure produced complete mortality. The larval stage was in general the most resistant at low temperatures, but the adult and pupal stages were by far the most resistant at 40°. In the case of eggs, larvae, and pupae the time required to effect complete mortality was the same at 30° and 32°, and only 1 day longer was required at 36° in the case of the eggs. Bales of cigar tobacco when placed in a cold-storage room at approximately 10° cooled down from 64° to 15° in from 2½ to 5½ days, depending on the size, shape, and covering of the bale. A 15-day exposure was required for the center of a hogshead of tobacco to drop to 15° in the same chamber. Eggs and pupae in the center of bales of Puerto Rican filler, the initial temperature of which was 78°, were all killed in 6 days after the bales were placed in a cold-storage room held at approximately 13°. Adults in the center of the same bales were killed in 6¼ days, while larvae were all killed in 8½ days."

A new beetle enemy of cotton (Coleoptera: Chrysomeloidea) [trans. title], A. da Costa Lima (*Campo [Rio de Janeiro], 7 (1936), No. 83, pp. 35, 36, figs. 3*).—Under the name *Melinophora iglesiasi* the author describes a new chrysomelid enemy of cotton observed at Cruzeta, Rio Grande do Norte.

Recent experiments with penetrating oil sprays for the control of bark beetles, K. A. Salman (*Jour. Econ. Ent., 31 (1938), No. 1, pp. 119–123*).—In work in California it has been determined that satisfactory mortality of bark beetle broods within or under the bark of infected ponderosa, Jeffrey, sugar, and lodgepole pine trees may result from external applications of penetrating oil sprays. The best control has been obtained with a light distillate type of oil in which crude flake naphthalene has been dissolved at the rate of three-quarters of a pound per gallon of oil. Brood resistance, infestation conditions, temperature, moisture, and thickness of bark cause great variation in the brood mortality resulting from the use of the oil spray.

Experimental results do not yet justify the general replacement of the peeling-burning method of bark beetle control by the oil-spray method. It may, however, be used to supplement other methods during the season of great fire hazard. The use of oil sprays appears to be of value in recreational areas or in commercial timber when infestation conditions or use requirements make it necessary to control forest insects during the summer. The fact that satisfactory results can be obtained by external applications of contact sprays makes further study of the method desirable.

Notes on *Leperisinus aculeatus* (Say) and its parasites (Coleoptera: Scolytidae), C. H. Hoffmann (*Jour. Econ. Ent., 31 (1938), No. 1, pp. 118, 119*).—The parasites of the bark beetle *L. aculeatus* found in a felled ash tree near Liberty Corner, N. J., are recorded.

The destruction of oak by the death-watch beetle, A. G. Norman (*Biochem. Jour., 30 (1936), No. 7, pp. 1135–1137*).—An experimental study of *Xestobium rufovillosum*, found to have damaged the oak timbers of Rothamsted House, the structural timbers of which are more than 300 yr. old, is reported upon. Some of the framing posts supporting the principal rooms were in a serious condition as a result of *Xestobium* attack and had to be replaced. The author's results confirm the observations of others on the activity of the larvae of this beetle, and leave no doubt that the carbohydrates of the cell wall are extensively utilized, either directly or more probably by the agency of an intestinal microflora. "Other wood-boring larvae, such as *Lyctus* and *Cossus*, apparently make no use of the skeletal material of the wood, since the frass obtained is almost identical in composition with the sound wood. Insofar as it is possible to form an estimate of the material removed by *Xestobium*, the cellulose accounts for 80 percent of the total loss, which in these timbers analyzed was in the region of one-third of the weight. In most microbiological fermentations with bacteria or fungi, it is unusual to find such a high proportion of the total loss accounted for by the cellulose, and this is an indication of the exceptional activity of the digestive system of these larvae."

The strawberry root weevil as a pest of conifers in nursery plantings, F. L. Gambrell (*Jour. Econ. Ent., 31 (1938), No. 1, pp. 107–113, figs. 2*).—This contribution from the New York State Experiment Station reports upon experimental work with the strawberry root weevil, particularly its occurrence on and injury to transplanted trees in the nursery. This insect has proved particularly troublesome to coniferous trees in some nursery plantings located in western New York and has been found either in the larval or adult stage on many host plants. The characteristics of this weevil, its injury, seasonal history, and control are dealt with, the details being given in five tables.

Two new curculionid pests in Rio Grande do Sul [trans. title], A. da Costa Lima (*Campo [Rio de Janeiro], 7 (1936), No. 84, pp. 23, 24, figs. 7*).—*Pantomorus parsevali* n. sp., attacking the sour orange at Porto Alegre, and *Lissorhoptrus oryzae* n. sp., which attacks the roots of the rice plant at Rio Pardo, are described.

[Work in apiculture by the Wyoming Station] (*Wyoming Sta. Rpt. 1937, pp. 23–25*).—The work of the year relating to breeding for resistance to American foulbrood, conducted in cooperation with the U. S. D. A. Bureau of Entomology and Plant Quarantine, wintering bees, and two-queen colonies is briefly considered in this report (E. S. R., 77, p. 67).

Honey flora of Victoria, [F. R. Beuhne et al.] (*Melbourne: Victoria Dept. Agr., 1935, 3. ed., rev., pp. [4]+136, figs. 93*).—A revised edition (E. S. R., 54, p. 462) in which important nectar- and pollen-yielding plants of value in honey production in Victoria are described and many of them illustrated.

Diseases of bees, E. J. Russell et al. (*[Rothamsted Expt. Sta., Harpenden], Rothamsted Confs. No. 22 [1936], pp. 43, pl. 1, figs. 2*).—Following an introduction by E. J. Russell, contributions are presented as follows: Brood Diseases in England—the Results of a Three-Year Investigation, by H. L. A. Tarr (pp. 7–16); Bee Paralysis, by G. D. Morison (pp. 17–21); Brood and Adult Bee Diseases in Switzerland, by O. Morgenthaler (pp. 22–30); and Control of American Foul Brood in the United States, by J. I. Hambleton (pp. 31–37).

Abridged report of the brood disease investigation for the year ending September 30th, 1936, H. L. A. Tarr (*Bee World, 17 (1936), No. 11, pp. 126–131, figs. 6*).—The distribution of and work with brood diseases by the Rothamsted Experimental Station are reported upon.

Studies on the rose-borer Neosyrista similis (Mocsáry) (Hymenoptera: Cephidae), K. Ho (*Bul. Sci. Fakult. Terkult., Kjuŝu Imp. Univ., Fukuoka, Japan, 7 (1936), No. 2, pp. 185–210, pl. 1, figs. 7; Eng. abs., pp. 209, 210*).—A description of the life history and habits of the Japanese rose stem borer *N. similis* is presented in this first part of the author's studies of an important enemy of the rose.

Introduction and recovery in Florida and Louisiana of parasites of the sugarcane borer, H. A. Jaynes (*Jour. Econ. Ent., 31 (1938), No. 1, pp. 93–95*).—In a further report on the results obtained in the introduction of South American parasites of the sugarcane borer into Florida and Louisiana (E. S. R., 67, p. 57; 69, p. 692) the results of the work conducted in Peru in 1932 and a summary of the work to January 1936 are presented.

Three species of parasites from South America have been released in Louisiana and Florida in an attempt at biological control of the sugarcane borer. These are the dexiid fly *Theresia claripalpis* V. d. W. and the hymenopterous species *Ipobracon rimac* Wolc. and *Bassus stigmaterus* Cress. Recoveries of *B. stigmaterus* are said to have been made in Florida.

The differential effect of environmental factors upon Microbracon hebetor Say (Hymenoptera : Braconidae) and its host, Ephestia kühniella Zeller (Lepidoptera : Pyralidae), III, N. M. Payne (*Biol. Bul., 73 (1937), No. 1, pp. 147–154*).—In this further contribution (E. S. R., 70, p. 812), the effect of the sting of the parasite and of two chemical agents on the respiratory rate and quotient of the larvae of the Mediterranean flour moth is dealt with.

A new microhymenopterous egg parasite of a pentatomid (Proctotrypoidea: Scelionidae) [trans. title], A. da Costa Lima (*Campo [Rio de Janeiro], 8 (1937), No. 85, p. 49, figs. 3*).—Under the name *Microphanurus scuticarinatus* an egg parasite of the pentatomid *Piezodorus guildinii* (Westw.) from Minas Geraes is described as new.

ANIMAL PRODUCTION

[Animal husbandry investigations of the Bureau of Animal Industry] (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt., 1937, pp. 8–10, 11–13, 15, 16, 17, 19, 20, 22–24*).—Included are brief reports on factors affecting the quality and palatability of meats, the value of milo heads in steer fattening, the carotene requirements of fattening steers, phosphorus deficiencies in ranges, the use of molasses in the steer fattening ration, grazing corn and velvetbeans with steers, rations for wintering breeding cattle, the value of feeding grain to steers on pasture and other pasture studies, marketing steers as yearlings or as 2-year-olds, methods in sheep feeding experiments, the management of sheep on the range, the composition and nutritive properties of goats' milk, a method for determining fineness of wool and other animal fibers, breed differences in the yield of grease and scoured wool, optimum protein levels for young pigs, factors involved in abnormal leg bone development of pigs, optimum amounts of ground alfalfa in the pig fattening ration, whey in swine rations, silage for pigs, the effect of age of weaning pigs on subsequent gain, a year-round grazing system for pigs, gilts v. mature sows for the production of market pigs, relative adaptability of rabbits and guinea pigs to digestion experiments with grasses, the effect of sunlight for hens on the hatchability of eggs, the effect of abnormal incubation temperatures, the artificial insemination of poultry, poultry feeding tests, the distribution of component fatty acids in egg yolk, and optimum temperatures for the incubation of turkey eggs. Much of the work reported was in cooperation with State experiment stations.

[Livestock investigations in New Mexico] (*New Mexico Sta. Rpt. 1937, pp. 27–29, 31, 76–79*).—Reports of progress (E. S. R., 77, p. 228) are presented on studies of the composition of range grasses and browse gathered at various stages of maturity, the increase or decrease of pingue (*Actinea richardsoni*) on grazed and protected areas, the calcium and inorganic phosphorus in the blood of range cattle, cottonseed meal for fattening yearling steers, confinement in batteries v. pen management of poultry layers, and the influence of different range crops and rations on the net returns from the laying flock.

[Livestock investigations by the Cornell Station] (*[New York] Cornell Sta. Rpt. 1937, pp. 103–110, 153–158, 159*).—A brief, concise history of the departments of animal and poultry husbandry, with a few of the most important results of the researches are set forth in this report.

[Livestock investigations in North Carolina], E. H. Hostetler, J. E. Foster, J. O. Halverson, H. B. Mann, R. E. Stitt, L. I. Case, W. H. Rankin, F. W. Sherwood, R. S. Dearstyne, C. O. Bollinger, G. K. Jones, and H. P. Brigman (*North Carolina Sta. Rpt. 1935, pp. 44–50, 56, 57*).—Included are progress notes on the following investigations: The relation of rate of growth in pigs to production, quality, and palatability of meat; the effect of feeding various amounts of soybeans to pigs; the effects of "hogging off" edible crops in a rotation on soil fertility; fish meal and cottonseed meal v. fish meal alone as protein supplements for fattening pigs; the utilization of various types of pasture by sheep; the meat and wool producing qualities of lambs from purebred rams on native ewes; the quality of meat of native v. grade Hereford yearlings; native reeds v. tame pasture for cattle; crop gleanings for wintering beef cattle; methods of establishing permanent pastures; vitamin A deficiency in cottonseed meal for beef cattle; the vitamin B and G complex in meals from high oil-bearing seeds; menhaden fish oil as a source of vitamin D for chicks; the influence of protein levels on the growth of pullets; factors in broiler production; a combined starter and developer mash v. separate starting and developing mashes for growing chicks; and cost of egg production.

Experiments with livestock in Texas] (*Texas Sta. Rpt. 1936, pp. 17, 18, 25–29, 38–45, 130–133, 136–140, 173, 177, 189, 236, 237, 241, 242, 243, 256, 271, 272, 273, 274, 275, 279, 286*).—Beef cattle investigations (E. S. R., 76, p. 516), reported by J. M. and J. H. Jones, H. Schmidt, R. E. Dickson, J. K. Riggs, P. R. Johnson, J. J. Bayles, E. K. Crouch, R. H. Stansel, E. B. Reynolds, W. H. Black, F. E. Keating, R. A. Hall, W. H. Dameron, O. L. Carpenter, and O. G. Babcock, include the carotene and vitamin A requirements of growing and fattening cattle, the mineral requirements of cattle and range mineral deficiencies in various sections of the State, native v. improved pastnres on the Gulf Coast prairie, type and individuality of steers as related to rate and economy of gain, limited v. full feeding for individuals and groups of steers, cottonseed cake and ground limestone as supplements to Sudan pasture, maximum amounts of roughage for fattening cattle, and fire brands v. chemical brands.

Sheep and goat studies reported by S. P. Davis, J. M. Jones, Dameron, H. C. McPhee, D. A. Spencer, J. H. Jones, B. L. Warwick, Dickson, Carpenter, I. B. Boughton, and W. T. Hardy include breeding, cytological, and hybridization with sheep and goats, grades and shrinkages of Texas wool and mohair, relation of age to fineness of wool and mohair fibers, vitamin A requirements of sheep, mineral supplements for sheep, cottonseed meal and salt feeding for lambs, adaptability of Corriedale sheep to southwest Texas conditions, and the value of crutching or tagging bred ewes.

Results of swine studies are noted on rice and rice byproducts for growing and fattening swine, self-feeding brood sows, the calcium requirements of pigs

receiving grain and cottonseed meal, the value of Sudan grass and oat pasture for fattening pigs, all by F. Hale; the effect of maternal vitamin A deficiency on tissue development and the position of organs in animal embryos, by Hale, Fraps, and L. G. Browman; and the quality and shrinkage of pork stored in oils and in air-slaked lime, by Hale, R. W. Snyder, and D. L. Jones.

Poultry studies by R. M. Sherwood, J. R. Couch, and Fraps gave information on the vitamin A and D requirements of chickens, slipped tendon and feathering vitamins, calcium and phosphorus requirements of chicks, and the mineral requirements for laying rations and commercial turkey rations.

Chemical studies by Fraps, A. R. Kemmerer, F. D. Fuller, R. Treichler, and C. D. Marrs gave information on the vitamin and mineral content of commercial and other animal feeds and butter and the hardness of cottonseed cake, and by Fraps and J. F. Fudge on the iodine content of Texas feeds and water supplies.

[Livestock investigations in Wyoming] (*Wyoming Sta. Rpt. 1937, pp. 12–14, 17, 18–20, 21, 22, 38, 39, 40, 41, 42, 45, 46*).—In these reports of progress at the main and substations (E. S. R., 77, p. 80) results are briefly noted on the value of phosphorus supplements in the winter ration of beef cattle; the mineral content of native and cultivated ranges; the rate of gain of various grades of feeder cattle; soybean meal v. cottonseed cake and dried beet tops v. alfalfa hay for yearling steers; the wool and mutton producing qualities of cross-bred lambs resulting from the mating of high grade Rambouillet ewes with purebred rams of different breeds; a comparison of alfalfa, Sudan, and Russian-thistle hays for fattening lambs; various home-grown feeds as supplements to alfalfa hay for fattening lambs; the value of crested wheatgrass, alfalfa, and native pastures for sheep; skim milk as a supplement to oats and barley for fattening pigs; methods of feeding grain and mash to laying hens; rations for young chicks; the weight of pullet eggs at different seasons of the year; the value of artificial light for laying turkey hens; and the effect of type of roost on the incidence of crooked breastbones in young turkeys.

Elimination of fat for potash clearing, R. Bogart and S. Long (*Kans. Acad. Sci. Trans., 39 (1936), pp. 257–261, figs. 8*).—A method for the continuous purification of the solvent in the extraction of fat from animal specimens to be used in bone studies is described. The effectiveness of various solvents in removing fat from the specimens is indicated.

The mineral content of Mauritius pastures, R. Lincoln (*Mauritius Dept. Agr., Sci. Ser. Bul. 26 (1937), pp. 14*).—Mineral analyses of 60 samples of pasture herbage, including a number of plant species collected from 6 different soil types, are presented. In general, pastures in Mauritius are more or less deficient in minerals as compared with British cultivated pastures. Nitrogen and potassium deficiencies are most pronounced, and the phosphorus content is generally low although averaging considerably higher than values found in the phosphorus-deficient areas of South Africa.

Bacteriological investigations on ensiling green forage with the addition of acid whey, skim milk, or sugar [trans. title], J. van Beynum and J. W. Pette (*Ver. Exploit. Proefzuivelboerderij Hoorn, Verslag, 1936, pp. 1–38, figs. 2; Eng. abs., pp. 35–38*).—The addition of acid whey, acid skim milk, and buttermilk to green forage at the time of ensiling is being widely practiced in the Netherlands. Studies regarding the beneficial effects of adding these dairy byproducts led to the conclusion that they are primarily due to the lactose content of such products, from which lactic acid is produced, and also to the added moisture which causes firmer packing of the silage and exclusion of air. The bacteria supplied by these acid milk products are of little or no importance in promoting more rapid lactic acid fermentation, and the quantity of acid supplied

is too small to be significant. It is pointed out that the addition of 20 percent whey to green forage will supply only about 1 percent sugar, which may not prove sufficient to insure good quality silage. A pH of less than 4.2 must be attained to prevent activity of butyric acid bacteria.

Investigations of silage prepared with additions of dairy byproducts or sugar [trans. title], E. BROUWER (*Ver. Exploit. Proefzuivelboerderij Hoorn, Verslag, 1936, pp. 39–102, figs. 15, Ger. abs., pp. 98–102; also Dept. Econ. Zaken* [*Netherlands*], *Verslag. Landbouwk. Onderzoek., No. 43* (*3*) *C* (*1937*), *pp. 55–118, figs. 15, Ger. abs., pp. 114–118*).—The silage samples studied included 121 lots prepared with the addition of whey or other dairy byproducts. Of these silages 86 consisted of grass, and most of these were of inferior quality, indicating that young grasses and other protein-rich crops were too high in protein and too low in sugar to allow satisfactory conservation by the addition of whey. Frequency curves of the pH values, butyric acid contents, and ammonia fractions for the different samples are presented. The ammonia and butyric acid contents showed a continuous increase with rising pH. The odor of such silage gave a good indication of the pH range and bacteriological type, and a single examination of odor and pH proved an effective means of judging the quality of the silage.

A number of lots prepared with the addition of 0.5 percent sugar were also examined. In general, the quality of these was superior to the lots prepared with whey, but this amount of sugar was insufficient to produce a uniformly good quality of silage. The relation between pH and ammonia content was similar in the sugar and whey samples, but for a given pH the butyric acid content was higher in lots receiving sugar than in those prepared with whey.

The preparation of silage with additions of dairy byproducts and the correlation between pH, ammonia values, butyric acid content, and odor of grass silage [trans. title] E. BROUWER (*Biedermanns Zentbl., Abt. B, Tierernähr., 9* (*1937*), *No. 4–6, pp. 508–524, figs. 9; Eng. abs., pp. 523, 524*).—This is a summary report of the research noted above.

Bacteriological examination of silages, prepared with the addition of whey, skim milk, and sugar on farms in the Netherlands [trans. title], J. VAN BEYNUM and J. W. PETTE (*Ver. Exploit. Proefzuivelboerderij Hoorn, Verslag, 1936, pp. 103–157, figs. 12; Eng. abs., pp. 152–156*).—The authors have examined 140 samples of silage prepared with additions of dairy byproducts with reference to the presence of lactic acid and butyric acid bacteria, percentage of dry matter, contents of acetic, butyric, and lactic acids, sugar, pH, and odor.

It is concluded that silages prepared without additions of inorganic acids may be classified into three types: (1) Those in which low temperatures prevail and a lactic acid fermentation takes place, reducing the pH below 4.2 because of a high sugar content in the fresh material. Such silages contain lactic acid and, theoretically, should contain no butyric acid, although a poor distribution of artificially added sugars often results in spots or layers of low sugar content in which butyric fermentation occurs; (2) materials of relatively low sugar content, in which all sugar is fermented before a pH of 4.2 is reached. This is considered an unstable pH range, since lactic acid is subsequently destroyed by butyric acid fermentation, acidity decreases, and putrefactive organisms develop rapidly; and (3) silages in which a very high temperature is reached, thereby destroying all lactic acid organisms. Such silages contain neither lactic nor butyric acid, and the odor resembles that of spontaneously heated hay.

The loss of carotene in hays and alfalfa meal during storage, E. A. KANE, H. G. WISEMAN, and C. A. CARY (*Jour. Agr. Res.* [*U. S.*], *55* (*1937*), *No. 11, pp.*

837–847).—Studies were conducted by the U. S. D. A. Bureau of Dairy Industry regarding the carotene losses in alfalfa, timothy, and clover hays and alfalfa meals of different degrees of fineness during storage at varying temperatures. Baled alfalfa stored in dark, unheated barn lofts at temperatures of 7.2° C. or less, from 7.2° to 18.9°, and above 18.9° lost carotene at average rates of 2.6, 6.6, and 17.8 percent per month, respectively. Baled timothy stored at 7.2° or less and at from 7.2° to 17.8° sustained carotene losses of 4.3 and 6.2 percent per month, respectively, and losses in clover hay stored at an average temperature of 11.1° averaged 6.3 percent per month. Alfalfa meals ground to pass through ⅛-, ¼-, and ¾-in. mesh screens lost carotene at the same rate during storage regardless of the degree of fineness and at practically the same rate as corresponding samples of baled hay. The carotene disappeared about three times as rapidly as the natural green color of the hay or meal.

Lactogen content of pituitary glands from rats on vitamin deficient rations, R. P. Reece, C. W. Turner, I. L. Hathaway, and H. P. Davis (*Soc. Expt. Biol. and Med. Proc., 37 (1937), No. 2, pp. 293, 294*).—In a joint study by the Missouri and Nebraska Experiment Stations, paired litter-mate rats were fed vitamin-deficient and vitamin-sufficient diets, respectively, until the vitamin deficiency was expressed. Rations deficient in vitamin A, vitamin B complex, vitamin D, and vitamin E, respectively, were included in the trial. At the end of the experimental feeding period the rats were sacrificed and their pituitaries removed, weighed, and assayed for lactogen content.

The pituitaries from rats on vitamin A- or vitamin E-deficient rations compared favorably in lactogen content with those from normal controls. The pituitaries from vitamin B-deficient rats were much smaller than those from the controls, and while the former contained less lactogen per gland they were superior to the latter per milligram of gland tissue. Vitamin D-deficient rats were inferior to the controls, both on the bases of lactogen per gland and per milligram of tissue.

The effect of antuitrin growth injections on female albino rats fed a diet deficient in vitamin A, E. J. Wimmer and J. C. Ayers (*Kans. Acad. Sci. Trans., 39 (1936), pp. 391–393*).—Rats which were maintained on vitamin A-deficient diets until their body stores were depleted showed decided weight gains, increased vigor, and improved coat condition when given daily intraperitoneal injections of 0.4 cc of antuitrin growth (an extract of the anterior pituitary gland) as compared with the noninjected controls. The vaginal smears of the injected animals changed from the cornified cell type typical of avitaminosis A to those with leucocytes and nucleated cells. However, injections of the hormone failed to prevent or cure xerophthalmia resulting from vitamin A deficiency or to cure the incontinence of urine, indicating that some factor or factors were lacking in the substitution.

Commercial feeds in Kentucky in 1936, J. D. Turner, H. D. Spears, W. G. Terrell, and L. V. Amburgey (*Kentucky Sta. Regulat. Ser. Bul. 14 (1937), pp. 56*).—A summary of the results of inspection and analyses of commercial feeding stuffs in 1936, together with special analytical data on 50 samples of legume and grass hays, 31 of shelled corn, and 142 of canned dog feeds, chemical standards for standard byproducts and special-purpose mixed feeds, and other information regarding feeds and their components are presented (E. S. R., 76, p. 375).

Inspection of commercial feedstuffs, P. H. Smith (*Massachusetts Sta. Control Ser. Bul. 89 (1937), pp. 57*).—This report presents analyses of 1,791 samples of feeding stuffs intended for livestock and poultry consumption, collected during the year ended September 1, 1937 (E. S. R., 76, p. 837).

Commercial feeding stuffs, L. S. WALKER and E. F. BOYCE (*Vermont Sta. Bul. 428 (1937), pp. 38*).—This is the usual report of the analyses for protein, fat, and fiber of 1,900 samples of feeding stuffs collected for official inspection during April 1937 (E. S. R., 77, p. 829).

Observations on the effect of different levels of hay feeding on the grain consumption and growth of calves [trans. title], L. PALOHEIMO (*Biedermanns Zentbl., Abt. B, Tierernähr., 9 (1937), No. 4–6, pp. 287–293; Eng. abs., p. 293*).—In further trials (E. S. R., 78, p. 678), calves on a diet composed solely of skim milk supplemented with cod-liver oil became unthrifty at from 2 to 4 mo. of age. Additions of corn meal to the skim milk diet did not improve the condition of the calves, but ground oats as a concentrate without hay gave practically as good results as when both hay and ground oats were fed. When no hay was allowed and grains were fed free choice, calves showed a pronounced preference for ground oats over corn meal, but when hay was supplied in abundance less oats than corn were consumed. Practically the same amount of hay was consumed when corn meal or ground oats were allowed as a concentrate, and with limited amounts of hay feeding practically equal amounts of concentrate were consumed when either corn or oats was offered.

The composition of limonites effective and ineffective in correcting "bush sickness" in cattle, R. B. BECKER and L. W. GADDUM (*Jour. Dairy Sci., 20 (1937), No. 12, pp. 737–739*).—The Florida Experiment Station obtained from the New Zealand Department of Agriculture two samples of limonite, one of which proved effective in preventing anemia (bush sickness) in cattle while the other was ineffective in this respect. The data obtained by spectrographic analysis of these samples are reported.

The two ores were quite similar in contents of copper, manganese, chromium, molybdenum, and vanadium. The ineffective ore contained 100 times as much barium as did the effective sample, and 0.005 percent of strontium but no cobalt, whereas the other ore contained no strontium but 0.005 percent of cobalt. Recent experimental work is cited to indicate that cobalt is an essential element in animal nutrition, and its absence from one of the ores is considered a possible explanation of its ineffectivenes in preventing this disease.

Productive sheep husbandry, W. C. COFFEY, edited by K. C. DAVIS, rev. by W. G. KAMMLADE (*Chicago: J. B. Lippincott Co., [1937], 3. ed., rev., pp. XXXII+479, pl. 1, figs. 262*).—The third edition of this textbook (E. S. R., 62, p. 187) has retained the same arrangement of subject matter material as in the earlier editions.

The evolution of the Australian Merino, E. W. COX (*Sydney: Angus & Robertson, 1936, pp. XXIII+160, pls. 31*).—This book deals with the history of the foundation of the Australian Merino breed of sheep and its subsequent development, with comments on the influence of certain breeding practices and the probable future development of the breed.

Biological studies on South African Merino wool production, V. BOSMAN (*Jour. Textile Inst., 28 (1937), Nos. 8, pp. P270–P306, pls. 2, figs. 11; 9, pp. P321–P353, figs. 7*).—This dissertation deals with methods of determining fleece characteristics, the interdependence of fleece characteristics, factors influencing wool production, and an extensive analysis of fiber fineness and other wool characters of South African Merino stud sheep, including plain-bodied and developed (wrinkled) strains.

It is shown that fleece density is dependent on the number of fibers per unit area of skin as well as on the fineness of the fibers. The relation of the scoured weight of wool to fiber length, cross-sectional area of fiber, specific gravity, number of fibers per unit area of skin, and total skin area is discussed.

and a slide rule is described whereby fleece characteristics can be compared conveniently in relation to wool production. Extensive sampling gave evidence that 80 percent of South African Merino wool ranged between 12.5μ and 22.5μ, conforming to quality numbers of 60s to 100s. The unreliability of crimp as a measure of fineness is stressed. It is suggested that for the purpose of improving South African wool production a system of fleece recording, based on precise arithmetical expressions of the fleece characteristics, be employed.

Fibre uniformity as a factor in Merino-wool production, V. BOSMAN (*Farming in So. Africa, 12 (1937), No. 140, pp. 443–445, figs. 4*).—This is an extract from the above report.

Grinding hay and grain for fattening lambs, G. A. BROWN and L. H. BLAKESLEE (*Michigan Sta. Quart. Bul., 20 (1938), No. 3, pp. 177–179*).—A summary of the results of a series of lamb feeding trials indicated that grinding or chopping hay for lambs is an extremely doubtful practice from the standpoint of economy of gains and cost of feeding. Grinding low quality roughage to induce consumption of coarse fibrous material which would be wasted when fed as long hay is also considered poor economy.

What amount of concentrates may be replaced by green alfalfa: Results of Scandinavian pig fattening experiments [trans. title], N. PETERSEN (*Ztschr. Schweinezucht, 44 (1937), No. 16, pp. 233–235*).—Feeding experiments are described in which varying amounts of green alfalfa (4–16 percent of total feed units) were introduced into a basal diet of cereal meal and skim milk. It appeared that additions of green alfalfa up to 10 percent of the ration (feed units) increased the rate of gain, reduced the feed required per unit of gain, and improved carcass quality. Moreover, it proved desirable to reduce the skim milk content of the ration from 20 to 12–16 percent when alfalfa was fed. The use of 12–16 percent of alfalfa gave less satisfactory results and is not recommended.

Substitutes for cereals in pig keeping (*[Gt. Brit.] Bacon Devlpmt. Bd. Bul. 2 (1937), pp. 62*).—This report of the English Bacon Development Board, based on an extensive survey of the literature, discusses the value of root crops, grass and forage crops, tropical carbohydrate feeds, milk byproducts, and household refuse as substitutes for cereals in the rations of fattening pigs and breeding stock. An extensive bibliography is appended.

The vitamins and their importance in swine breeding [trans. title], R. W. LENTZ (*Ztschr. Schweinezucht, 44 (1937), No. 20, pp. 291–293*).—The effects of vitamin deficiencies, with particular reference to the requirements for vitamins A, D, and E in normal growth and reproduction of swine, are discussed.

The effects of fish meal on the quality of pork products [trans. title], BÜNGER (*Ztschr. Schweinezucht, 44 (1937), No. 17, pp. 245–247*).—Feeding trials with four groups of pigs from approximately 70 kg live weight to slaughter weight (84 days) are reported. All pigs received 700 g of cereal meal daily and ensiled potatoes ad libitum. In addition, those in group 1 received 300 g of herring meal daily throughout the trial. Group 2 also received 300 g of herring meal daily for 56 days, this being replaced by 4 kg of skim milk during the last 4 weeks. Group 3 received 150 g of herring meal and 2 kg of skim milk throughout, and group 4 the same as group 3 for 56 days but 4 kg of skim milk only during the last 4 weeks. All groups gave flesh and oil free from fishy or oily tastes or odors. Liverwurst prepared from the liver of pigs in each group was also of satisfactory quality.

Feeding and growing of draft foals, R. S. HUDSON and L. H. BLAKESLEE (*Michigan Sta. Quart. Bul., 20 (1938), No. 3, pp. 175–177*).—In a further report (E. S. R., 72, p. 827), data are presented on average weights and gains of three

groups of draft colts (Dakota range mares × Belgian stallions) fed at different levels of nutrition from October 1933 through March 1936. Colts fed liberally during the first winter and a conservative or limited ration during each following winter and those fed conservatively (1 lb. of grain and 1 lb. of legume hay daily per hundredweight, plus oat straw ad libitum) from the time of weaning to work age developed satisfactorily. Colts fed a limited grain ration (½ lb. of grain daily per hundredweight) lacked condition and weight and were least desirable for sale at any time during the experiment.

The National Poultry Improvement Plan (*U. S. Dept. Agr., Misc. Pub. 300* (*1938*), *pp. 23*).—The objectives and regulations of the National Poultry Improvement Plan are set forth in this publication. "The primary purpose of the plan is to identify, authoritatively, poultry-breeding stock, hatching eggs, and chicks with respect to quality by describing them in terms uniformly accepted in all parts of the country."

Poultry feeding tests: Results at Werribee, W. O. PEDERICK and A. G. CLARK (*Jour. Dept. Agr. Victoria, 35* (*1937*), *No. 10, pp. 485–487*).—The results of three poultry feeding tests, each employing 50 pullets per experimental pen and extending over a period of 12 mo., are reported by the Central Research Farm.

A comparison of protein concentrates when a dry mash and mixed grain were fed showed that highest egg production and highest profit over feed cost resulted from 10 percent of dried buttermilk in the mash, followed in order by 10 percent of meat meal, 10 percent of dried buttermilk plus 3 percent of dried whey, and 10 percent of meat meal plus 3 percent of dried whey. However, when three pens were offered free choice of meals and grains the pen receiving meat meal only as a protein concentrate excelled in egg production and in profit over feed cost, followed in order by the pen receiving meat meal and dried whey and the one receiving only dried buttermilk. In the third trial the feeding of a wet mash containing 10 percent of meat meal with mixed dried grain fed in the litter gave a higher profit over feed costs than when soaked grains were fed twice daily with the birds having free access to protein concentrate. The latter method resulted in an excessively high consumption of the concentrate.

The value of peanuts and peanut meal in rations for chickens, D. F. KING and G. J. COTTIER (*Alabama Sta. Circ. 80* (*1937*), *pp. 13*).—This circular presents the results of three feeding trials with laying pullets each involving 10 lots of 40 birds each and three trials with growing chicks each involving 15 lots of 100 chicks, in which various kinds and amounts of peanut products were incorporated in the experimental rations.

Feeding whole peanuts and whole yellow corn ad libitum to laying pullets resulted in very low egg production and unsatisfactory body weight. Peanut meal proved superior to any other peanut product as a sole source of protein supplement in the laying ration. Adding skim milk (dried or fluid) to supply 50 percent of the protein supplement materially improved the efficiency of the peanut products for hens. Ground peanuts in shells in combination with skim milk gave satisfactory egg production and hatchability. All of the peanut products proved very unsatisfactory as sole sources of protein for growing chicks, and in each instance growth rates were materially improved when these were supplemented by animal proteins. Peanut meal as the sole protein or supplemented with animal protein gave better results than the other peanut products. Dried buttermilk proved superior to meat scrap as a supplement for peanut feeds. Feeding ground peanuts without shells to either hens or chicks gave very poor results, probably due to the high fat content of such a ration.

Formulas using peanut products in laying and growing rations, which have proved satisfactory, are presented.

Methods and rations for fattening poultry.—II, Experimental technique and comparative value of fattening rations, H. S. GUTTERIDGE (*Sci. Agr.*, *18 (1937), No. 4, pp. 198–206*).—Continuing this study (E. S. R., 77, p. 837), a sampling technic is described whereby comparable samples of tissue representative of the average fat percentage of the carcass may be obtained at the beginning and end of an experimental feeding period. This consisted in removal of a small strip of skin with the adhering subcutaneous fat from the large feather tract upon the breast parallel to the keel at the beginning of the feeding period. At the completion of the fattening test birds were slaughtered and an identical sample taken from the opposite side of the body. A high degree of correlation was found to exist between the fat content of such samples and the average fat content of the carcass. Because of the variable nature of gain in body weight and increase in percentage of fat, it is considered necessary to use relatively large numbers of individuals in an experimental group (at least 40) and to adjust for the effect of correlated variables such as feed consumption, initial body weight, initial level of fat, etc., if valid comparisons are to be made.

In a series of fattening tests reported, using a control basal ration of ground yellow corn mixed with skim milk, the addition of 5 percent of mutton-fat to the basal diet increased the live weight gain, efficiency of feed utilization, increased percentage of fat, and percentage of grade A birds by 18, 27, 15, and 17 percent, respectively. Adding 5 percent of molasses did not affect gain in weight or percentage increase in fat and reduced the percentage of grade A birds by 10. The addition of 5 percent of ground oystershell improved the palatability of the ration but had no other significant effect.

The utilization of food elements by growing chicks, III, IV, C. W. ACKERSON, M. J. BLISH, and F. E. MUSSEHL (*Nebraska Sta. Res. Buls. 96 (1937), pp. 7; 97 (1938), pp. 7*).—Previous studies (E. S. R., 78, p. 681) are continued.

III. *A comparison of calcium carbonate and calcium sulfate as sources of calcium.*—The effectiveness of calcium carbonate and calcium sulfate as sources of calcium for growing chicks when each was supplied at a rate to provide 1.5 percent of calcium in the ration was determined by means of growth and body analysis experiments. The percentage rate of gain and the gain per gram of nitrogen fed was identical for the two groups, and the retention of nitrogen, calcium, and phosphorus was not influenced by the source of calcium.

IV. *Meat meal and fish meal compared with meat meal, fish meal, and soybean meal as protein concentrates.*—The effectiveness of an all-mash ration containing 6.42 percent each of meat meal and fish meal as the principal source of protein was compared with one containing 5 percent each of meat meal, fish meal, and soybean meal in growth and body analysis experiments with young chicks. The gain in live weight per gram of nitrogen or of dry matter fed was practically identical in the two lots, and in each lot approximately 41 percent of the nitrogen fed was retained in the gain. The slight variations in the percentage retention of calcium and phosphorus was judged as insignificant since variations within lots were as great as those between lots.

The influence of limestone flour and bone meal feeding on egg shell formation, A. M. GERICKE, M. J. VAN DER SPUY, and U. W. SCHMIDT (*So. African Jour. Sci.*, *34 (1937), pp. 303–316, figs. 2*).—Groups of White Leghorn pullets receiving a low mineral basal ration, basal plus 2 percent of bonemeal, and basal plus 2 percent of bonemeal and 3 percent of limestone flour, respectively, were compared over a 1-yr. experimental period with reference to feed consumption,

live weight, egg production, and quality of eggshell. Live weight differences between the groups were insignificant, both at the beginning and end of the trial. Both the basal and bonemeal groups developed an abnormal appetite for grit during the course of the trial. The bonemeal group produced the most eggs and required less feed per unit of production. The bonemeal plus limestone group was only slightly inferior to the bonemeal group in rate of production and yielded heavier eggshells of higher calcium content than the other groups. Eggs of poor shell texture were more prevalent during the summer months (November, December, January, and February) than in the other months of the year.

Tolerance levels of seleniferous grains in laying rations, W. E. Poley and A. L. Moxon (*Poultry Sci., 17 (1938), No. 1, pp. 72–76, figs. 2*).—The selenium content of the four experimental rations used in this study at the South Dakota Experiment Station was adjusted at 0, 2.5, 5, and 10 p. p. m., respectively, by varying the proportion of toxic grains in the all-mash laying ration. Four pens of 15 Rhode Island Red pullets were fed the respective rations for an experimental period of 6 weeks, which was preceded and followed by 2 weeks of normal grain feeding. None of the rations containing seleniferous grains had a significant effect on the average feed consumption, average weight of birds, weekly egg production, or fertility of the eggs. The hatchability of fertile eggs was not appreciably affected by 2.5 p. p. m. of selenium in the ration, but was slightly reduced at the 5 p. p. m. level, and decreased to zero by the end of 4 weeks' feeding at the 10 p. p. m. level. Growth and mortality of chicks hatched from hens receiving the 5 p. p. m. level were not affected. Chicks hatched from hens receiving 10 p. p. m. showed a relatively high mortality rate, but the growth rate of survivors was not affected.

The relation of selenium content of grains in the ration to the selenium content of poultry carcass and eggs, A. L. Moxon and W. E. Poley (*Poultry Sci., 17 (1938), No. 1, pp. 77–80*).—Findings by the South Dakota Experiment Station indicated that the selenium content of eggs, meat, and certain internal organs of hens receiving varying levels of selenium as supplied by toxic grains in the ration is closely associated with the selenium content of the ration fed. When the level of selenium feeding was 2.5 p. p. m. or less the eggs and meat contained a level of selenium below that suggested as the tolerance limit for selenium in foods, but at 10 p. p. m. the content of meat and eggs was above the suggested tolerance limit.

The development of a ration for the study of perosis in chicks, L. E. Clifcorn, C. A. Elvehjem, and E. B. Hart (*Poultry Sci., 17 (1938), No. 1, pp. 28–32*).—In tests at the Wisconsin Experiment Station to develop a ration for the study of perosis in chicks, it was found that one (No. 604) composed of a beef kidney-dextrin mixture (15:48), crude casein, brewers' yeast, cod-liver oil, tricalcium phosphate, an alcoholic extract of rice bran, and a salt mixture (69:14:2:2:3:5:5) gave satisfactory results. Practically all chicks on this ration developed perosis, and very few showed any signs of paralysis. The addition of the extract of rice bran was necessary to prevent encephalomalacia.

Studies on the prevention of perosis in the chick, A. C. Wiese, C. A. Elvehjem, E. B. Hart, and J. C. Halpin (*Poultry Sci., 17 (1938), No. 1, pp. 33–37*).—Tests were conducted to determine the effectiveness of various substances for preventing perosis in chicks when administered as supplements to the experimental rations described in the preceding abstract.

The addition of 15 percent of rice bran to three different rations entirely prevented the occurrence of slipped tendon. Autoclaving the rice bran destroyed the factor which prevented perosis. Ninety-five percent ethyl alcohol, 1 percent sulfuric acid, or concentrated glycerol extracts of rice bran failed to prevent the

disorder. Inositol, skim milk powder, oats, wheat middlings, wheat bran, whole peanuts, and yeast all proved ineffective at the levels fed. The addition of 0.0025 or 0.005 percent of manganese to ration 604 prevented perosis. Apparently some labile substance, either alone or in association with manganese, was operative in preventing perosis in such a ration, but with another ration, containing higher levels of calcium and phosphorus, the addition of 15 percent of rice bran plus manganese was ineffective. The total blood phosphorus of chicks was lower on the basal ration plus manganese than on the basal ration alone or with the rice bran supplement.

Pullet mortality: Some observations on the effect of adding wheat germ meal to the laying ration, J. A. Davidson and P. J. Schaible (*Michigan Sta. Quart. Bul., 20 (1938), No. 3, pp. 169–175*).—Three laying rations, one of which was high in vitamin A, another low in vitamin A, and the third similar to the first in composition but containing less vitamin A and 5 percent of wheat germ meal which replaced a part of the middlings and meat scrap, were compared with White Leghorn pullets. The addition of wheat germ meal to the ration did not increase egg production, the percentage of fertile eggs, or percentage hatchability of fertile eggs over the high vitamin A ration, while the low vitamin A diet was poorest in all respects. The incidence of "pick outs" was highest in the group receiving wheat germ meal but, excluding this cause of death, the mortality of the three lots was similar and comparable to a large number of birds housed in the same building during these trials.

The rôle of vitamin G in reproduction in poultry, H. J. Davis, L. C. Norris, and G. F. Heuser (*Poultry Sci., 17 (1938), No. 1, pp. 81–86, fig. 1*).—In a study at the [New York] Cornell Experiment Station, groups of White Leghorn pullets were maintained on vitamin G-deficient and vitamin G-adequate diets, respectively, over a 16-week experimental period. The deficient diet contained approximately 100 Cornell units of vitamin G per 100 g, while this factor was abundantly supplied in the adequate diet by 7.5 percent of dried whey in the mixture. Egg production, fertility of eggs, egg size, feed consumption, and physical condition of the hens were not affected by this addition of vitamin G to the deficient diet. The percentage hatchability of fertile eggs produced on the deficient and adequate diets were 9 and 63, respectively. Two peaks of mortality were observed in the embryos of hens on the deficient diet, occurring at the third and seventh to tenth days of incubation and with the greatest mortality at the latter peak. Only the third-day mortality peak occurred in the embryos of hens on the adequate diet, and the rate was much less than that in deficient embryos at the third day. The deficient embryos grew more slowly, averaging 27 percent smaller than those from hens on the adequate diet after 16 days' incubation.

Further evidence on the amount of vitamin G required for reproduction in poultry, H. J. Davis, L. C. Norris, and G. F. Heuser (*Poultry Sci., 17 (1938), No. 1, pp. 87–93*).—In further trials excellent hatchability of fertile eggs was obtained by supplementing the vitamin G-deficient diet with synthetic riboflavine, thus indicating that hatchability was not influenced by the protein supplied by the dried whey in the trials noted above. Rapid depletion of the vitamin G reserve in hens occurred when a deficient diet was fed, so that a sharp decline in hatchability occurred in eggs produced during the fourth week and a further marked reduction in hatchability after 9 weeks of deficiency feeding. The building up of a vitamin G reserve was just as rapid when adequate amounts of this factor were supplied. Optimum hatchability was obtained when 245 Cornell units of vitamin G per 100 g of ration were supplied, while 205 units per 100 g gave poorer results, essentially confirming the previous report of

the [New York] Cornell Station (E. S. R., 76, p. 378). Mortality of chicks from hens on the deficient diet was greater than that from properly nourished hens, particularly during the first week after hatching.

Some observations on egg-yolk color, H. W. Titus, J. C. Fritz, and W. R. Kauffman (*Poultry Sci., 17 (1938), No. 1, pp. 38–45, fig. 1*).—The effects of feeding graded quantities of purified leaf xanthophyll, pimiento peppers, chili peppers, yellow corn, and certain extracts of chili pepper and yellow corn to laying hens on egg yolk color were studied by the U. S. D. A. Bureau of Animal Industry. Yolk color values are reported in terms of Heiman-Carver yolk "color roter" readings and also according to the Munsell system of color notation.

It was evident that by varying the diet the color of the egg yolk was made to vary over a wide range. The yolk color roter readings ranged from an average minimum of 8 on the basal ration to an average maximum of about 22 at the upper limits of pimiento or chili pepper feeding. After such pigmented feeds were added to the diet it was necessary for an average of approximatetly 5 eggs to be laid before color readings reached the maximum value, while a still longer and more variable period was required for yolk color to reach a minimum after such feeds were discontinued.

The feeding of pure leaf xanthophyll and yellow corn in graded amounts gave similar results with reference to the hue, brilliance, and chroma of the yolk color, while the effects of feeding chili and pimiento peppers were somewhat different in this respect. The feeding of charcoal, bone char, activated charcoal, and Lloyd's reagent had no marked effect on yolk color. Apparently those carotenoid pigments which contain 1, 2, or 3 hydroxyl groups are readily transferred from the feed to the egg yolk.

Progress report upon the investigation of off-flavored turkeys, P. J. Schaible, R. Griswold, J. A. Davidson, and E. J. Miller (*Michigan Sta. Quart. Bul., 20 (1938), No. 3, pp. 127–131*).—Data are presented on the palatability of 10 roasted turkeys, each of which had been subjected to a different feeding regime as described.

A bird receiving 4 percent of animal feeding grade of cod-liver oil in an all-mash ration for 10 days before slaughter and then held in cold storage for 5 days after slaughter before being drawn had a pronounced objectionable cooking odor and objectionable flavor, especially in the skin and drippings. Turkeys similarly fed but drawn immediately after slaughter showed similar odor and flavor defects, although somewhat less pronounced. One of this lot which was skinned before cooking was better in flavor than the unskinned bird. Feeding 2 percent of animal feeding grade of cod-liver oil, 2 percent of cod-liver oil concentrate, 4 percent of medicinal grade cod-liver oil, 0.4 percent of trimethylamine hydrochloride, or 4 percent of betaine hydrochloride in the ration for from 14 to 16 days before slaughter was without serious detriment to the palatability of the cooked birds when they were drawn immediately after slaughter.

Fishy flavor and odor in turkey meat, D. R. Marble, J. E. Hunter, H. C. Knandel, and R. A. Dutcher (*Poultry Sci., 17 (1938), No. 1, pp. 49–53*).—Turkeys were reared at the Pennsylvania Experiment Station on rations containing no fish products (check), 1 percent of cod-liver oil, 10 percent of whitefish meal, and a combination of cod-liver oil and fish meal, respectively. At the end of 20, 24, and 26 weeks of experimental feeding, pairs (one male and one female) were removed from each of the rations containing fish products and placed in the group receiving the control ration. When 28 weeks old, one male and one female reared under each feeding regime were slaughtered. The carcasses were roasted in separate ovens, and the degree of fishy flavor in the breast meat,

thigh meat, and drippings and the odor of the whole carcass were scored by 19 judges.

Fishy flavor and odor were pronounced in the carcasses of all birds which had received either cod-liver oil, fish meal, or the combination of the two for the entire 28 weeks, particularly when the combination was fed. More pronounced fishy flavor and odor were apparent in the females than in the males, probably due to the higher degree of fattening in the former group. The removal of both cod-liver oil and fish meal from the diet 8 weeks prior to slaughtering practically eliminated the occurrence of both fishy flavor and odor.

DAIRY FARMING—DAIRYING

Proceedings [of the] twenty-third annual meeting, western division, American Dairy Science Association (*Amer. Dairy Sci. Assoc., West. Div., Proc. Ann. Mtg., 23 (1937), pp. [3]+87, figs. 4*).—The following listed papers are published in full in the proceedings of the meetings held at Portland, Oreg., October 3, 1937 (E. S. R., 77, p. 532): Some Experiences With Artificial Insemination of Dairy Cattle, by D. L. Fourt, A. O. Shaw, and E. M. Gildow (pp. 17–21); Managing Irrigated Pastures, by A. S. King (pp. 26–30); Variations Between Animals Used in Digestion Experiments, by R. E. Hodgson and J. C. Knott (pp. 31–36); Phosphorus Requirement of Dairy Cattle, by J. R. Haag, I. R. Jones, and H. K. Dean (pp. 37, 38); Feeding Salmon Oil to Dairy Heifers (Preliminary Report), by I. R. Jones and J. R. Haag (pp. 39–45); The Influence of a Sole Alfalfa Hay Ration on the Reichert-Meissl and Iodine Values of Milk Fat, by H. C. Hansen and A. O. Shaw (pp. 46–56); Influence of Different Pasteurization Temperatures in Killing Bacteria, Yeasts, and Molds in Cream, by G. H. Wilster and H. P. C. Nielsen (pp. 57–62); The Status of the Babcock Test, by E. L. Jack and F. H. Abbott (pp. 63–68); and Milk Fat as a Factor in the Foaming Tendency of Casein, by N. P. Tarassuk and G. A. Richardson (pp. 70–78).

[Dairy cattle investigations in New Mexico] (*New Mexico Sta. Rpt. 1937, pp. 55–57, 58, figs. 3*).—Results are briefly noted on the physiological effect of a hegari fodder and cottonseed meal ration on dairy cows and their calves and the effect of such rations on the vitamin A stores in the livers of cows and the vitamin A content of the butterfat produced.

[Studies with dairy cattle in North Carolina] (*North Carolina Sta. Rpt. 1935, pp. 53–55*).—Brief results are noted on the comparative value of peanut hay v. soybean hay and of alfalfa v. *Lespedeza sericea* hay for milk production, Kudzu as a grazing crop for heifers, herd improvement, and cooperative dairy-crop utilization studies, all by C. D. Grinnells.

[Investigations with dairy cattle in Texas] (*Texas Sta. Rpt. 1936, pp. 134, 135, 136*).—Brief results are noted on the vitamin A requirements for growth, maintenance, and milk production in dairy cattle, by G. S. Fraps and O. C. Copeland; minerals necessary in commercial dairy feeds, and cottonseed meal and hulls as a ration for milking cows, both by Copeland; maintaining permanent pastures in east Texas, by E. B. Reynolds and Copeland; and ground v. unground grain for milking cows, by A. L. Darnell and Copeland.

[Experiments with dairy cattle in Wyoming] (*Wyoming Sta. Rpt. 1937, pp. 14–16, 32*).—Results are briefly noted on a comparison of roughages for growing heifers, a sole roughage ration (alfalfa hay in winter and pasture in summer) v. roughage and grain, and open sheds v. modern closed barns for milking cows.

[Progress in dairy research] (*Univ. Reading, Natl. Inst. Res. Dairying, Ann. Rpt., 1936, pp. 78*).—The research activities of the institute and brief summaries

of 64 papers published during the year ended September 30, 1936, are presented in this report.

Investigations regarding the production records in the Thorsätra herd under stall feeding and grazing [trans. title], I. JOHANSSON (*K. Landtbr. Akad. Handl. och Tidskr., 76 (1937), No. 7, pp. 771–821, figs. 24; Eng. abs., pp. 817–820*).—The milk production of this herd of Swedish Red and White cattle averaged 6,700 lb. of milk per cow per year from 1913–20, 9,000 from 1921–30, and 11,500 lb. from 1931–36. During the last 12 yr., the cows were on pasture approximately 150 days per year without additional feed. The pasture supplied 47.5 percent of the total feed consumed during the year, and approximately 50 percent of the yearly milk yield was produced during the grazing season.

An analysis of the production records over these periods gave evidence that at least one-half of the increase in yield was due to improved environmental conditions and, further, that the improvement in the average genetic standard of the herd was primarily due to rigid culling among the raised and tested animals. During the period 1931–36 the yield during the lactation periods was independent of the month of calving. Forty-three percent of the total variation in milk yield, 45 percent of the variation in butterfat content, and 28 percent of the variation in shape of the lactation curve (the percentage of the total butterfat produced per lactation period of not more than 300 days, which was produced in the first 100 days) were found to be due to variation between animals, whereas the rest was due to variation from year to year in the yield of the same individual. The variation between families was rather small and insignificant.

The influence of underfeeding protein on the milk production of fresh cows [trans. title], P. KAJANOJA (*Biedermanns Zentbl., Abt. B, Tierernähr., 9 (1937), No. 4–6, pp. 525–530; Eng. abs., p. 530*).—Moderate underfeeding of protein had little or no effect on the initial rise in milk production during the early stage of the lactation period. However, when the intake of pure protein was reduced to approximately the level of that secreted in the milk a decrease in milk production and also a decrease in the fat content of the milk resulted.

The action of herring oil before and after hydrogenation on the yield and fat percentage of the milk of the goat, W. R. GRAHAM, JR. (*Jour. Dairy Sci., 21 (1938), No. 1, pp. 45–48, fig. 1*).—Trials were conducted at the Missouri Experiment Station by the author with the assistance of P. T. Cupps over a period of 11 weeks, in which the ration of lactating goats contained either 2 oz. of herring oil or 2 oz. of hydrogenated herring oil per head daily.

The animals consumed the ration containing the hardened oil with their usual appetite, but after a few days on the mixture containing the plain oil the goats refused their feed so that the oil had to be administered by syringe. The oil feeding resulted in a subsequent reduction in the percentage of butterfat in the milk produced by these animals, while similar amounts of hydrogenated fat in the diet had little or no effect on the percentage of fat. Apparently the factor or factors responsible for the reduction in percentage of fat is due to some particular grouping of the unsaturated bonds in the fish oils. The effect produced by oil feeding appeared to be generalized throughout the body rather than localized in the secretion of the mammary gland.

Studies of the blood precursor of milk fat, L. A. MAYNARD, C. M. MCCAY, G. H. ELLIS, A. Z. HODSON, and G. K. DAVIS (*[New York] Cornell Sta. Mem. 211 (1938), pp. 16*).—The initial phases of this study concern methods of obtaining representative samples of arterial and mammary venous blood for analysis,

Of the several methods tried, obtaining arterial samples from the internal pudic artery by entrance through the vagina proved most satisfactory. Data were obtained on the camparative cell volume, density, total solids, and iron of whole blood, and total solids and protein of the plasma from arterial, mammary-vein, and jugular-vein samples.

When the veins were sampled simultaneously, followed by arterial sampling, the cell volume, total solids, and iron of arterial whole blood were lower than the venous samples, but when the order of sampling was reversed no consistent differences in these factors were evident. These differences in concentration were confined to whole blood and were not exhibited by the plasma. The former order of sampling was generally followed in these trials.

In studying the blood precursors of milk fat, total lipids, lipid phosphorus, phospholipids, phospholipid fatty acids and their iodine numbers, total cholesterol, ester cholesterol, and free cholesterol were determined in the plasma of the arterial and venous samples. There was no indication that either phospholipid fatty acids or those tied to cholesterol were removed by the secreting gland, indicating that these are not precursors of milk fat. Total lipids were consistently lower in the mammary venous samples, and calculated values for fatty acids present as neutral fats indicated that the gland must be removing this fraction of the blood lipids, thus suggesting that it is a precursor of milk fat.

Nature's compensation for the lost quarter of a cow's udder, W. W. Swett, C. A. Matthews, F. W. Miller, and R. R. Graves (*Jour. Dairy Sci., 21 (1938), No. 1, pp. 7–11, figs. 3*).—The U. S. D. A. Bureau of Dairy Industry cites the case of a Jersey cow which came into milk at the age of 2 yr. 6 mo. with "both rear quarters blind" and yet produced 7,223 lb. of milk and 410 lb. of butterfat in 365 days during this lactation period. Photographs of udder sections secured shortly after the second calving shows that the tissue of the front quarters had pushed backward and displaced a large part of the space normally occupied by the rear quarters. This case is considered as evidence of the ability of nature to compensate to a large extent for the loss of udder quarters when such loss occurs early in life.

Some factors affecting the accuracy of the Babcock test on composite samples of milk, C. W. England and G. D. D'Ambrogi (*Maryland Sta. Bul. 413 (1937), pp. 151–182, figs. 3*).—Composite samples of milk were prepared by making daily additions of 10.4 cc of milk to each sample for the duration of the holding period. These samples were preserved by 1 (0.48 g) mercuric chloride tablet and held for 7, 10, and 15 days at 45°, 60°, 80°, and 100° F. In addition, samples preserved with ½ tablet and with 2 tablets were held for 7, 10, and 15 days at 60° and 100°. Also single samples of a definite volume were held under the same conditions as above. Fresh sample tests were compared with the tests of all preserved samples.

In all cases fat tests of the composite and preserved samples were lower than the fresh sample average test. As the time of holding and the temperature of holding each increased the resulting fat test decreased. Samples preserved with 1 tablet and held at 45° and 60° for 7 and 10 days averaged only 0.053 percent lower than fresh samples, those held for 15 days at 45° and 60° averaged 0.08 percent lower, and those held at 80° and 100° averaged 0.167 percent lower. Highest tests were obtained on samples preserved by 1 tablet, with ½-tablet samples next, and 2-tablet samples lowest.

An evaluation of several methods of cooling cream, W. J. Caulfield and W. H. Martin (*Jour. Dairy Sci., 21 (1938), No. 1, pp. 13–20, figs. 2*).—Further studies (E. S. R., 76, p. 531) have been made to determine the relative efficiency of five different methods of cooling cream, including (1) placing cans in a

refrigerator, (2) submerging cans in a cooling tank containing continuously flowing water, (3) allowing water to flow over the outside of the cans, (4) the use of a spray, and (5) the evaporation method. The temperature of the cooling water in each case averaged 66°–68° F., and the refrigerator temperature ranged from 35°–40°.

These methods were ranked in the order of 2, 3, 1, 4, and 5 with reference to the rate of cooling during the first 2 hr., while at the end of 6 hr. cream cooled by the first method was slightly cooler than that cooled by the second or third and several degrees cooler than that by the fourth or fifth method. Sweet cream cooled more rapidly and to a lower temperature than sour cream irrespective of the method. It required about 6 hr. for cream to reach the lowest attainable temperature when cooled by the evaporation method. At constant relative humidity, fluctuations in room temperature tended to be accompanied by corresponding changes in cream temperature under the evaporation cooling, while the efficiency of this system was impaired at relative humidities above 60 percent. The use of this system proved feasible as a means of retarding temperature rise in cream cooled by other methods.

Dairy bacteriology, B. W. HAMMER (*New York: John Wiley & Sons; London: Chapman & Hall, 1938, 2. ed., pp. XIV+482, figs. 45*).—A revised edition of this popular textbook (E. S. R., 60, p. 864) is noted.

Classification of the organisms important in dairy products.—II, Pseudomonas fragi, R. V. HUSSONG, H. F. LONG, and B. W. HAMMER (*Iowa Sta. Res. Bul. 225 (1937), pp. 117–136*).—This series of investigations (E. S. R., 76, p. 685), has been continued. *P. fragi* was isolated from numerous dairy products during the course of this study.

The most common defect due to the organism was the development of a characteristic odor resembling that of the flower of the May apple, followed by a pronounced rancidity, such a defect being observed in samples of milk, cream, cottage cheese, bulk condensed milk, and butter. The organism was also occasionally responsible for cheesiness in unsalted butter. *P. fragi* was readily isolated from such defective products by plating, incubating at 21° C., and picking characteristic colonies, or by placing samples of normal raw milk at from 5° to 7° until a defect developed and then plating. The organism being psychrophilic in character did not grow on plates incubated at 37° for standard counts. Four cultures were studied for colony variation. Three distinct types of colonies were recognized, the morphology and cultural characteristics of which are described. These varied widely in lipolytic and proteolytic activity and in their action on litmus milk, thus making the organism difficult to identify until the variations in colony type are understood.

A rapid phosphomonoesterase test for control of dairy pasteurization, H. SCHARER (*Jour. Dairy Sci., 21 (1938), No. 1, pp. 21–34, fig. 1*).—The test described for the control of pasteurization in milk, cream, and related dairy products consists in measuring quantitatively the enzymatic hydrolysis of a suitable substrate when incubated with a sample of the test milk for 1 hr. This test can be completed in less than 90 min. and will demonstrate such minor faults in pasteurization technic as (1) a temperature of 1° F. below the 143° standard, (2) heating for 25 min. instead of 30 min. at 143°, and (3) the addition of 0.5 percent of raw milk to properly pasteurized milk or cream. A simple field test which can be completed in 10 min. and which has definite diagnostic value is also described. Thirty-three references to the literature are cited.

Chemistry of butter and butter making.—IV, The relationships among the cream acidity, the churning loss, and the churning time, E. W. BIRD,

D. F. BREAZEALE, and E. R. BARTLE (*Iowa Sta. Res. Bul. 227 (1937), pp. 173–220, figs. 7*).—Continuing these studies (E. S. R., 78, p. 97), three series of creams, viz, 20, 30, and 37.5 percent fat, were pasteurized while sweet, and batches were subsequently ripened to give a pH range of from 4.5 to 7.0 in each series.

Churning losses (calculated as a percentage of the total fat churned) for all lots showed little variation in a pH range of 7.0 to 5.5. Below pH 5.5 churning losses rose steadily with decreasing pH to a maximum at 4.8 or 4.9 for the 20 and 37.5 percent creams, while losses in the 30 percent cream showed a slight rise but no definite maximum within this zone. With all creams the loss dropped sharply and in practically linear fashion from pH 4.8 or 4.9 to 4.5. Churning time showed rather close correlation to pH of the buttermilk for the 20 percent cream, but little correlation existed between these factors for the higher testing creams, probably due to increased viscosity, greater ease of whipping, lower specific gravity, and other complicating factors. Also it appeared that no hard and fast rule could be drawn regarding the relation of churning time to fat losses in the buttermilk.

On the basis of total fat churned, losses in highly ripened low fat cream (from 18 to 20 percent) were approximately equal to those in 30 percent sweet cream and slightly higher than in 37.5 percent sweet cream. A hypothesis is advanced regarding the nature of the protective action at the fat globule interface and the churning process.

Studies on the neutralization of cream for buttermaking.—IV, The effect of dilution with water on the titratable acidity of milk, F. H. McDOWALL, R. M. DOLBY, and A. K. R. McDOWELL (*New Zeal. Jour. Sci. and Technol., 19 (1937), No. 1, pp. 38–46, figs. 3*).—Continuing this series of investigations (E. S. R., 78, p. 692), data are presented on the titratable acidity of fresh and artificially acidified samples of undiluted milk and of milk samples diluted with water in proportions of 1 to 1, 2, 4, 7, and 10, using varied amounts of a standardized solution of phenolphthalein as an indicator, with standardized rosanaline acetate solutions as color standards.

Under all test conditions the titratable acidity declined as the proportion of water to milk in the dilution increased. The fall in acidity was independent of the original acidity of the milk. The pH of the phenolphthalein end point in the titrated samples also declined as the proportion of water increased. The amount of indicator used and the concentration of the color standard exerted a pronounced effect on the titratable acidity, the smallest decline occurring when only 1 cc of phenolphthalein solution was used, irrespective of the dilution of the milk with 1 cc of rosanaline acetate solution for each 20 cc of diluted milk as a color standard. The losses were approximately twice as great when 1 cc of indicator per 20 cc of the titration liquid and only 1 cc of rosanaline solution in the color standard were used. Definition of the exact conditions of titration are very essential in determining the significance of the effect of dilution on titratable acidity of milk.

The relation of the spectro vitamin A and carotene content of butter to its vitamin A potency measured by biological methods, G. S. FRAPS and A. R. KEMMERER (*Texas Sta. Bul. 560 (1938), pp. 21*).—Employing butter samples obtained in a previously described study (E. S. R., 77, p. 237), the amounts of vitamin A and carotene present in the samples were determined by the spectrographic method as described, and these values were related to the vitamin A potency of the fat as determined biologically.

Two formulas are presented for expressing the relationship between spectro vitamin A plus carotene and the biological value, i. e., (1) $U=DS+1.4C$ or (2)

$U=6.8\ (S-0.8)+1.4C$, in which U is the number of Sherman-Munsell units of vitamin A per gram of sample, S the spectro vitamin A in parts per million, and C the carotene in parts per million. In the first formula the value of D is 4.3 or 5.6 when spectro vitamin A is below or above 3.4 p. p. m., respectively. Equally good agreement was found with the two equations.

In 21 of the 32 samples, the difference between results by the two methods was 4 units or less, and most of the additional samples showed reasonable agreement. A unit of vitamin A in butter as determined chemically appeared to have greater biological potency than a unit of vitamin A in cod-liver oil determined in the same way.

Some observations on the vitamin A value of butter produced under drought conditions, B. L. Kunerth and W. H. Riddell (*Jour. Dairy Sci.*, *21* (*1938*), *No. 1*, *pp. 41–44*).—The Kansas Experiment Station determined by physicochemical methods the vitamin A value for butter samples from three groups of cows, including (1) an experimental lot of Holstein cows which had been maintained in dry lot for 2½ yr. on a ration of prairie hay and a grain mixture of white corn, wheat bran, and cottonseed meal 1:1:1, (2) the station herd of Holsteins at the end of the 1936 drought summer when very little pasture had been available since the previous spring, and (3) commercial dairy herds subjected to conditions similar to group 2.

Butter from group 1 contained 10.08 international units of vitamin A and 1.34 international units of β carotene, or a total vitamin A value of 11.42 international units per gram, which is approximately one-fourth the computed vitamin A value of butter produced under good feeding conditions. Samples from groups 2 and 3 ranged from 12 to 16.4 international units of vitamin A and from 3.5 to 7 international units of β carotene, or total vitamin A values of 18.8 to 19.9 international units per gram.

Milk supplies to cheese factories, F. H. McDowall (*New Zeal. Jour. Sci. and Technol.*, *19* (*1937*), *No. 3*, *pp. 145–164*, *figs. 3*).—This discussion relates to the high average butterfat content of New Zealand cheeses and the low yield of cheese per pound of butterfat purchased by the cheese factory due to the high average butterfat test of the dairy cattle population. Under these conditions cheese factories experience difficulty in maintaining milk supplies in competition with butter factories, and certain methods are suggested for meeting this situation. Data are presented to indicate that under conditions of dry-lot feeding the average cheese production per unit of feed consumed is virtually the same for Jersey, Ayrshire, and Holstein breeds of cattle.

A test for extraneous matter in cheese, D. W. Spicer and W. V. Price (*Jour. Dairy Sci.*, *21* (*1938*), *No. 1*, *pp. 1–5*).—This test, developed by the Wisconsin Experiment Station, briefly consists of preparing a cheese solvent by dissolving 150 g of sodium citrate in 1,000 cc of distilled water, placing 100 g of the cheese to be tested in a quart milk bottle, adding a suitable amount of the solvent solution, placing the bottle in a water bath at 140° F. and stirring with a mechanical agitator until the cheese is completely dissolved, and then filtering one-half of the mixture through a single sediment disk.

It is proposed that the results of such tests be classified as good, fair, unsatisfactory, and bad. Classification of cheese scores according to sediment grades showed average scores of 89.7, 89.4, 88.4, and 88.1, respectively, for good, fair, unsatisfactory, and bad samples, indicating that sediment is not the fundamental cause of poor cheese.

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Econ. Zaken [Netherlands], Verslag. Landbouwk. Onderzoek., No. 43 (5) C (1937), pp. 175–190, figs. 3; Eng. abs., pp. 189, 190).—When the lactose equilibrium between the free whey and the whey retained by the curd was destroyed by adding water to the cheese vat the lactose content of the free whey, which was greatly reduced by dilution with water, showed a very rapid rise for a few minutes after the water was added due both to the diffusion of the lactose and the expulsion of whey from the contracting curd. The rise in the free whey was slight after 15 min., and equilibrium was practically established in from 20 to 30 min.

The role of eggs in ice cream, W. H. Martin (*Ice Cream Trade Jour., 33 (1937), No. 11, pp. 29–32*).—The author has reviewed the results obtained by numerous investigators on this subject. Twenty-one references to the literature are cited.

Use of anti-oxidants in ice cream, A. C. Maack and P. H. Tracy (*Ice Cream Rev., 21 (1938), No. 6, pp. 82–85*).—In studies at the Illinois Experiment Station the addition of 0.5 percent oat flour to vanilla ice cream mix either by mixing it with the sugar or adding it in dry form at the freezer exerted a protective action against development of oxidized flavors in the ice cream for several weeks and improved the body of the product. The slight oat flour flavor in the ice cream was not objectionable. The use of a water extract of oat flour was not satisfactory because of its weak antioxidative properties. Similar additions of oat flour retarded the development of metallic flavors in strawberry ice cream when 1 p. p. m. or less of copper was present, but it was more difficult to control the development of stale metallic flavors in strawberry ice cream by the addition of antioxidants than in the case of vanilla.

Stabilization of ice cream with sodium alginate, V. C. Stebnitz and H. H. Sommer (*Ice Cream Rev., 21 (1938), No. 7, pp. 36–38, 64, 66, 68, 70–72, figs. 9*).—A more detailed report of this research (E. S. R., 77, p. 537).

The survival of pathogenic microorganisms in ice cream, G. I. Wallace (*Jour. Dairy Sci., 21 (1938), No. 1, pp. 35, 36*).—In a further report (E. S. R., 71, p. 382) it is noted that *Salmonella enteritidis* and *Brucella abortus* Bang have survived storage in ice cream at a temperature of −10° F. for 7 yr. and *Mycobacterium tuberculosis hominis* and *M. tuberculosis bovis* for 6½ yr., and that further tests will be necessary to determine their longevity. Of the other strains tested, *S. aertrycke* survived for 6 yr., *B. melitensis* for 5, *M. avis* for 4½, and *B. abortus porcine* for 4 yr.

The effect of serving temperature upon consumer acceptance of ice creams and sherbets, W. H. E. Reid and W. S. Arbuckle (*Missouri Sta. Res. Bul. 272 (1938), pp. 34, figs. 11*).—The essential conclusions presented in this bulletin have been previously noted (E. S. R., 78, p. 694).

VETERINARY MEDICINE

[Work in animal pathology and parasitology by the Bureau of Animal Industry] (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt., 1937, pp. 4–7, 24–26, 27–30, 42–64*).—The work of the year (E. S. R., 76, p. 688) dealt with the detection and control of Bang's disease; vesicular stomatitis; vesicular exanthema of swine; hog cholera and its control; the use of dips, disinfectants, antiseptics, and anthelmintics and of tuberculin and mallein; diagnostic tests; eradication of scabies and dourine; control of anthrax; inspection and quarantine of animals; infectious equine encephalomyelitis and clinically related diseases; equine infectious anemia (swamp fever); swine erysipelas; anaplasmosis; the isolation of an organism culturally and pathogenically identical with *Coryne-*

bacterium ovis from western deer; comparative studies of actinomycosis and actinobacillosis; tuberculosis of sheep due to the avian type of tubercle bacillus; potency studies of rabies vaccines in rabbits; the control of paratuberculosis by the use of intradermic johnin; the use of antigens in the poultry-improvement plan, in an outbreak of chronic fowl cholera, and in an epizootic of arthritis in several flocks of pigeons; investigations of stock-poisoning plants; tick eradication; tuberculosis in bovines, poultry, and swine; parasites of horses, ruminants, swine, poultry, and other animals; and treatment for the removal of ecto- and endoparasites.

[Work in animal pathology and parasitology by the Texas Station] (*Texas Sta. Rpt. 1936, pp. 13–17, 22, 23, 135, 136, 275–279, 286, 287*).—The work of the year with livestock affections (E. S. R., 76, p. 533) briefly reported includes loin disease in cattle, infectious bovine abortion, lechuguilla poisoning and trichostrongyles in sheep and goats, anaplasmosis, and effect of molds grown on ground hegari heads on sheep in the feed lot, all by H. Schmidt; miscellaneous poisonous plants (including *Sartwellia flaveria*, *Gutierrezia microcephala*, and *Croton corymbulosis*) and jimmies in sheep and goats, both by F. P. Mathews; locoweed poisoning (*Astragalus earlei*, *Oxytropis saximontana*, and *A. mollissimus*), by G. S. Fraps, E. C. Carlyle, and A. W. Walde; Bang's disease, by Schmidt and O. C. Copeland; and at the Sonora Substation, swellhead of sheep and goats, hard yellow livers of sheep and cattle, contagious ecthyma (sore mouth) of sheep and goats, stomach worms (*Haemonchus contortus*) of sheep and goats, miscellaneous feeding trials of suspected plants (*Lepachys columnaris*, *Dalea lasianthera*, *Opuntia engelmannii*), and infections enterotoxemia of young lambs, all by I. B. Boughton and W. T. Hardy, and bone oils for cuts, by O. G. Babcock.

[Work in animal pathology and parasitology by the Wyoming Station] (*Wyoming Sta. Rpt. 1937, pp. 18, 20, 21, 27–29, 31*).—Work with selenium in plants and animals that have consumed such plants, toxicity of the ground lichen (*Parmelia molliuscula*), cyanide poisoning from arrowgrass (*Triglochin maritima*) and the cultivated sorghums, infectious sore mouth of lambs, stiff lambs, infectious abortion of sheep, coryza (roup) in chickens, parasites of sheep, and the relation between the parasites of wild and domestic animals are briefly considered in this report of the work of the year (E. S. R., 77, pp. 67, 101).

[Contributions on animal pathology and bacteriology] (*Jour. Bact., 35 (1938), No. 1, pp. 3, 18, 19, 30, 31, 36, 37, 39, 40, 41, 42, 62, 65, 66*).—Abstracts of contributions on animal pathology and bacteriology presented at the annual meeting of the Society of American Bacteriologists held in Washington, D. C., in December 1937 include three noted elsewhere in this issue and the following: Some Factors Affecting the Germicidal Efficiency of Hypochlorite Solutions, by A. S. Rudolph and M. Levine (p. 3); Comparison of *Bacterium necrophorum* From Ulcerative Colitis in Man With Strains Isolated From Animals, by G. M. Dack, L. R. Dragstedt, R. Johnson, and N. B. McCullough (pp. 18, 19); The Relation of Virulence to the Course of *Salmonella aertrycke* Infection in Mice, by R. M. Pike and G. M. Mackenzie (pp. 30, 31); Limiting Factors of Sulfanilamide's Action and the Phenomenon of Potentiation, by R. R. Mellon and L. E. Shinn (pp. 36, 37); The Isolation of *Actinomyces bovis* From Tonsils, by C. W. Emmons (pp. 39, 40); The Immunizing Properties of Formalinized Cultures of Rocky Mountain Spotted Fever Rickettsiae Grown in Modified Maitland Media, by I. A. Bengtson (pp. 41, 42); Japanese B Encephalitis Virus: Its Differentiation From St. Louis Encephalitis Virus and Relationship to Louping-Ill Virus, by L. T. Webster (p. 42); and Prevalence and Classification of

Hemolytic Streptococci in Pasteurized Milk, by L. W. Slanetz (pp. 65, 66) (N. H. Expt. Sta.)

A guide to veterinary parasitology for veterinary students and practitioners, T. Southwell and A. Kirshner (*London: H. K. Lewis & Co., 1937, pp. X+143, figs. [101]*).—An epitome of veterinary parasitology systematically arranged and including a tabulation of the parasites of meat and fish and of the stages of the more important parasites infective to animals, a host-parasite list, and diagrams illustrating life histories.

A multiple pipetting machine, W. N. Plastridge and L. F. Williams (*Jour. Lab. and Clin. Med., 23 (1937), No. 3, pp. 318–320, figs. 2*).—The setting up of the serological tubes with the proper amount of antigen suspension in the application of the tube agglutination test for the diagnosis of Bang's disease in cattle and pullorum disease in poultry having become an economic problem in many laboratories, a mechanical pipetting machine capable of filling 140 tubes per minute was devised for the purpose at the [Connecticut] Storrs Experiment Station. A description and plans are given for its construction, at a reasonable cost.

Some simple apparatus for the culture of surgical maggots used in the treatment of chronic osteomyelitis and other suppurative infections, M. S. Tarshis (*Jour. Lab. and Clin. Med., 22 (1937), No. 10, pp. 1055–1061, figs. 8*).—A description is given of an economical method of culturing maggots for surgical use which has been devised by the author.

Sulfanilamide, L. A. Merillat (*Vet. Med., 33 (1938), No. 2, pp. 53–55*).—A discussion of its value in the treatment of diseases of animals.

Suckleya suckleyana, a poisonous plant, F. Thorp, Jr., A. W. Deem, H. D. Harrington, and J. W. Tobiska (*Colorado Sta. Tech. Bul. 22 (1937), pp. 19, figs. 10*).—Unexplained cattle losses which have occurred in the plains section of northeastern Colorado in recent years, in which in a number of instances cattle have died suddenly in the vicinity of completely or partially dried up water holes or shallow ponds, led to the work here reported.

In the course of a limited survey of this plains section, *S. suckleyana*, which has become rather common in the area in moist bottoms and water holes and along the edges of lakes, and for which the name poison suckleya is suggested, was found responsible for numerous cattle losses. It has been found by chemical analysis and feeding tests to be cyanogenetic. The qualitative test for hydrocyanic acid was positive for every specimen examined. Quantitative tests showed a variation of hydrocyanic acid concentration from 0.0364 to 0.002 percent as compared with 0.0135 percent contained in a sample of stunted cane. The *S. suckleyana* which had the highest hydrocyanic acid concentration (0.0364 percent) proved when force fed to be toxic for cattle, sheep, rabbits, and guinea pigs. Symptoms of intoxication developed rapidly, followed by death or a quick recovery, depending on the quantity administered. The sodium nitrite and sodium thiosulfate treatment brought about rapid recovery in one heifer which showed increasingly progressive symptoms of intoxication induced by artificial feeding.

Further observations on oat hay poisoning, F. Thorp, Jr. (*Jour. Amer. Vet. Med. Assoc., 92 (1938), No. 2, pp. 159–170*).—In this further contribution from the Colorado Experiment Station (E. S. R., 76, p. 693) a description is given of serious losses among cattle that occurred after the feeding of oat hay, weedy barley hay, and wheat straw. In all but two of the cases observed the hay was fed when damp. The symptoms observed in the cattle were suggestive of hydrocyanic acid poisoning, but in only two instances was a trace of this substance found in the hay.

When the oat hay responsible for one outbreak was fed experimentally to six cattle, all died showing symptoms and lesions typical of oat hay poisoning. The rumen contents of four of the six animals showed positive tests for hydrocyanic acid by the sodium picrate paper method.

Sheep and horses were not injured by feeding the oat hay or weedy barley hay that had proved lethal to cattle.

Aqueous, alcoholic, acid, and alkaline extracts of the offending oat hay were harmless when administered to laboratory animals.

Does grasshopper and cricket control work involve hazards to livestock? F. T. Donaldson and H. Welch (*Montana Sta. Bul. 351 (1938), pp. 7*).—Analyses of samples taken from fields dusted with sodium arsenite, with the calculation of the dangerous dose based upon such analyses, have shown that the use of grasshopper bait does not endanger livestock when the bait is spread correctly and care is exercised in storing or discarding unused portions; further, there appears to be no hazard involved in feeding crops from fields dusted with sodium arsenite for the control of Mormon crickets, provided the dusting is done in accordance with recommended practices. The work was conducted in cooperation with the U. S. D. A. Bureau of Entomology and Plant Quarantine.

Recent contributions to the immunology of helminthic infections, J. T. Culbertson (*Arch. Path., 25 (1938), Nos. 1, pp. 85–117; 2, pp. 256–280*).—This contribution, which is accompanied by a bibliography of five pages, deals with experimental evidence on immunity, conditions or agencies which affect resistance, the basis of immunity against parasites, applications of immunologic phenomena in helminthology, and other immunologic phenomena of significance in helminthology.

Attempts to induce an artificial immunity against the dog hookworm Ancylostoma caninum and the pig ascaris Ascaris lumbricoides suum, K. B. Kerr (*Amer. Jour. Hyg., 27 (1938), No. 1, pp. 52–59*).—In the experiments here reported attempts were made to induce an artificial immunity in mice to the dog hookworm *A. caninum* and in guinea pigs to the pig ascarid *Ascaris lumbricoides suis*. None of the four antigens used in the attempts to immunize against the dog hookworm gave significant results. Ten of the 20 guinea pigs subjected to a series of injections with dried powdered ascaris antigen survived test infections. It is suggested that the failure to stimulate an obvious resistance may be due either to the size of the test infection or to the types of antigens used. A list is given of 12 references to the literature.

Lymnaea philippinensis, an intermediate host of Fasciola hepatica in the Philippines, with some observations on the bionomics of the parasite, Z. de Jesus (*Philippine Jour. Sci., 58 (1935), No. 3, pp. 299–315, pl. 1*).—The indigenous snail *L. philippinensis* Nevill is widely distributed in the Philippine Islands and has been definitely shown by the author to be an intermediate host of the common liver fluke *F. hepatica*.

Biology of Lymnaea philippinensis, an intermediate host of Fasciola hepatica and Fasciola gigantica in the Philippines, Z. de Jesus and A. I. Mallari (*Philippine Jour. Anim. Indus., 6 (1937), No. 5, pp. 501–513, pls. 2, fig. 1*).—Report is made of a study of the biology of a common fresh water snail, *L. philippinensis*, which has been definitely shown to be an intermediate host of the two common liver flukes of ruminants in the Philippines, *F. hepatica*, as noted above, and *F. gigantica*, by Manipol in 1937. This snail is indigenous and widely distributed in the Philippines in both the lowlands and highlands.

"Under laboratory conditions, and taking the first oviposition as the criterion, sexual maturity of this snail is reached at the age of from 17 to 22 days, and its longevity ranges from 94 to 110 days. . . . While this snail multiplies

throughout the year, it multiplies faster in May, June, and July. Each snail can lay from 18 to 26 egg masses, and each mass contains from 4 to 37 ova, which hatch after an incubation period of from 6 to 12 days.

"Under laboratory conditions this snail dies on drying mud after an exposure of 16 days, and, under field conditions it dies, together with its eggs, in a swampy field which [has] dried for a period of about 3 mo., showing that this snail could be eradicated even in irrigated fields by allowing these fields to dry for 3 mo. during the dry season. In the presence of swamp mud and algae, together with pieces of stems and leaves of grasses, a 1 to 1,000,000 solution of copper sulfate killed both young and adult snails in 10 to 30 min. and rendered the ova inside the egg masses not viable after an exposure of from 6 to 24 hr., but a 1 to 10,000,000 solution did not affect at all the adult and young snails, as well as the ova in the egg masses, even after a long exposure."

The prevention of anthrax, L. Van Es (*Nebraska Sta. Circ. 56 (1938), pp. 7*).—A brief practical account of the anthrax germ, mode of infection, and measures for control.

Foot-and-mouth disease in Great Britain (*Jour. Min. Agr. [Gt. Brit.], 44 (1938), No. 10, pp. 948–958*).—An account dealing with the character and history of foot-and-mouth disease; the policy and procedure for dealing with outbreaks in Great Britain; details of outbreaks, October-November 1937; the measures taken to prevent the introduction of infection from abroad; status of research; and the export trade in pedigree stock in relation to the disease.

Foot-and-mouth disease and vesicular stomatitis: A comparative microscopical study, J. E. Barnard (*Roy. Soc. [London], Proc., Ser. B, 124 (1937), No. 835, pp. 107–113, pls. 3*).—This contribution describes and demonstrates the microscopical appearances, and the differences that have been observed in infective material obtained from primary vesicles, resulting from the inoculation of suitable susceptible animals with foot-and-mouth disease and vesicular stomatitis.

Diarrheic diseases of adult cattle, R. A. McIntosh (*Vet. Med., 33 (1938), No. 3, pp. 132–136, figs. 2*).—This contribution presents comparative data on Johne's disease due to *Mycobacterium paratuberculosis*, coccidiosis due to *Coccidium (Eimeria) zurnii*, winter dysentery thought to be due to *Vibrio jejuni*, and malignant catarrh due to a virus.

Bang's abortion disease in North Carolina, W. Moore, C. D. Grinnells, and L. J. Faulhaber (*North Carolina Sta. Tech. Bul. 54 (1937), pp. 32, fig. 1*).—This report is based on data accumulated during the course of 8 years' work with 25 dairy herds, having been undertaken in order to develop and improve methods that will work under conditions as they are in North Carolina. Details regarding the 25 herds are presented in as many tables.

A study of the vaginal content of pregnant Bang-infected cows for the presence of Brucella abortus, C. P. Fitch, W. L. Boyd, and L. M. Bishop (*Jour. Amer. Vet. Med. Assoc., 92 (1938), No. 2, pp. 171–175*).—In 44 examinations made by the authors at the Minnesota Experiment Station of the vaginal content of 58 cows reacting to the agglutination test for Bang's disease, *B. abortus* was found in 2 examinations before the seal of pregnancy had broken. "*B. abortus* was isolated from the placentas of 20 of the above animals showing an active uterine infection. Eleven of these animals aborted and 9 calved at full term. Forty-six animals calved at term, and *B. abortus* was isolated from the placentas of 20 percent and from the colostrum of 77 percent of such animals.

"These studies indicate that *B. arbortus* is not ordinarily found in the vagina of pregnant, Bang-infected cows until very shortly before an abortion or a

normal parturition. This organism, however, appears in the discharge after the seal of pregnancy is broken."

The so-called delayed agglutination reaction in cattle vaccinated against Bang's disease, H. L. GILMAN (*Jour. Bact., 35 (1938), No. 2, pp. 201, 202*).—This abstract relates to the plate (rapid) agglutination test as applied in the diagnosis of *Brucella* infection in cattle. The claim by some workers that with vaccinated animals the maximum titer is not reached until after 15 min. led to comparative studies.

In plate agglutination tests made of 542 vaccinated cattle, all under 18 mo. of age, in which readings were made at 8 and 15 min., the reading of 439 tests was the same. "A partial increase in titer, in a given dilution, was shown in 96 tests; of one plus in 4; of plus and partial in 3. No distinction was made between the degrees of partial agglutination at any one titer. If the readings on these samples were made regularly at 15 min. the interpretation would have been changed from negative to suspicious in 11 samples, and from suspicious to positive in an additional 11 samples. The changes were not considered highly significant."

A study of experimental streptococcic mastitis in dairy cattle, C. S. BRYAN (*Vet. Med., 33 (1938), No. 2, pp. 72–74*).—In continuation of studies of mastitis at the Michigan Experiment Station (E. S. R., 76, p. 850; 77, p. 542; 78 p. 850) the author reports upon the experimental introduction of streptococcic mastitis into normal cows through the use of a typical strain of *Streptococcus agalactiae* recently isolated from a case of chronic mastitis.

The cows subjected to the experimental exposure became infected only after repeated exposure by dipping either the uninjured or the injured teats into the culture. When the teats were injured sufficiently to draw blood, infection developed as a result of one exposure. Repeated exposure of the cows to the *Streptococcus* per os, or by the subcutaneous or intravenous routes, did not result in streptococcic mastitis. Of the six cows used in these experiments four became infected by dipping the teats into the culture, one by dipping the lacerated teat into the culure, and one (the control cow of the second year) with no experimental exposure but exposed to the *Streptococcus* as a result of being stabled in the same barn with the infected cows.

"These results indicate the difficulty of controlling streptococcic mastitis within a herd, even though the infected cows are segregated apart from the noninfected cows and sanitary procedures are employed in handling the dairy herd. Such procedures are of value in the control of infection, since the control of the first year's study was protected from infection by these means."

The relation of certain physical factors to infection with streptococcic mastitis, C. S. BRYAN and G. E. TAYLOR (*North Amer. Vet., 19 (1938), No. 1, pp. 26–30; abs. in Michigan Sta. Quart. Bul., 20 (1938), No. 3, pp. 187, 188*).—It is pointed out that mastitis streptococci apparently gain entrance to the udder through the teat canal or through injuries of the udder and teats, and according to present knowledge do not invade the udder by way of the blood stream. This being the case, the spread of streptococcic mastitis depends on external factors or processes that are responsible for carrying the germs from cow to cow and aid the bacteria in gaining entrance to the udder and on the virulence of the germs. In a study of 121 cows no difference was noted with respect to the initial location of the streptococci in the rear or front quarters. Dairy cows rested on the right side 51.68 percent of the time as compared to 48.31 percent of the time on their left side.

The tests employed, in decreasing order of efficiency in detecting early cases of streptococcic mastitis, are: (1) Microscopic test, (2) physical examination of

the udder, (3) leucocyte content of the milk, (4) chloride content of the milk, (5) thybromol test, and (6) physical examination of the milk. Fifty-one out of 67 cows became infected during the first 3 mo. of their lactation period.

Characteristics of staphylococci associated with bovine mastitis, W. N. PLASTRIDGE, F. J. WEIRETHER, and L. F. WILLIAMS (*Jour. Bact., 35 (1938), No. 1, p. 66*).—This is an abstract of a report on further work at the [Connecticut] Storrs Experiment Station (E. S. R., 77, p. 396), giving the results of an attempt to correlate certain properties of udder staphylococci with other laboratory evidence of mastitis.

"Quarter samples, collected periodically from animals in four experimental herds, were examined for streptococci, coliform organisms, and staphylococci and as to macroscopic appearance, reaction to bromothymol blue, and leucocyte content. The staphylococci were tested for ability to hemolyze cow's blood and to coagulate blood plasma and for deportment on Chapman's differential media.

"Ability to coagulate human blood plasma was found to correlate more closely with accepted laboratory evidence of mastitis than any other staphylococcus test employed. Over 90 percent of the coagulase-positive cultures were from animals yielding samples containing 500,000 or more leucocytes per cubic centimeter. Of 207 coagulase-positive cultures, 87 percent hemolyzed cow's blood, 90 percent grew on alkaline bromothymol blue agar, 98 percent acidified phenol-red mannitol agar (Difco), and 80 percent were considered positive on crystal violet agar. Omitting samples showing mixed infection and those collected during early or late lactation, less than 5 percent of the coagulase-negative cultures were asociated with a high leucocyte count. Of the coagulase-negative cultures, 5 percent hemolyzed cow's blood, 49 percent grew on alkaline bromothymol blue agar, and 60 percent acidified mannitol agar.

"The incidence of infection with coagulase-positive staphylococci at any given time varied from 10 to 35 percent. Less than half of the infected animals gave milk that reacted positively to the bromothymol blue test, and less than 15 percent gave milk that was abnormal in appearance."

The effect of sulfanilamide upon the streptococci in the udder of mastitis cows and a method for its estimation in milk, H. BAUER and M. F. GUNDERSON (*Jour. Bact., 35 (1938), No. 1, pp. 66, 67*).—According to this abstract conflicting results were obtained. In one of the four cows to which sulfanilamide was administered the streptococci disappeared following treatment, reappeared upon discontinuance of the drug, and were again absent after treatment was resumed. In the other three treated cows a decrease in the number of streptococci following treatment was noted.

Infection with Trichomonas foetus in heifers, J. ANDREWS and F. W. MILLER (*Amer. Jour. Hyg., 27 (1938), No. 2, pp. 235–249, fig. 1*).—Observations aimed at determination in a herd of 40 heifers, of the mass effect of *T. foetus* which was studied throughout its first complete pregnancy cycle with special reference to the appearance, persistence, and possible effects of infection with this organism, are reported. The methods of obtaining vaginal specimens and the limitations of diagnostic technic are discussed, and a description is given of an improved method of examination and of a new type of vaginal pipette or syringe.

"The origin of the trichomonad infections seemed to be most highly associated with the first breeding experience of the heifers. The length of time that flagellates could be found in the vagina varied greatly; in the majority of the cases remaining detectable for from 7 to 20 weeks by the method of examination employed. Most of these infections declined spontaneously in clinical severity and in zoological density. It is still questionable as to whether the organisms dis-

appear completely in time or are retained indefinitely in small numbers. Abortion, stillbirth, pyometritis, delayed conception, and sterility were definitely associated with venereal trichomoniasis, particularly with the more prolonged infections. The generative disability observed in the heifers did not appear to be due to impotence or sterility of the bulls employed, to Bang's or other intercurrent disease, to malnutrition, or to mismanagement. In spite of the fact that the nonfertile heifers were served repeatedly by infected bulls they showed no evidence of reinfection comparable to their original infection. Bulls serving the heifers studied showed at the same time regularly higher efficiencies in breeding cows in the same herd.

"The interpretation of the above epidemiological findings is that trichomonad disease in heifers is sexually transmitted, is variable in its duration, that it tends to be self-limited, that serious reproductive disturbances are associated especially with prolonged infections, and that specific resistance to *T. foetus* is acquired as a result of infection so that cows in a herd in which the disease is endemic are more efficient breeders than heifers even when the same bulls are used for both. These epidemiological conclusions are supported by previously published clinical and experimental observations."

A list of 18 references to the literature is included.

Healthy cattle as carriers of coccidia, H. Marsh (*Jour. Amer. Vet. Med. Assoc., 92 (1938), No. 2, pp. 184–194, figs. 3*).—In work at the Montana Experiment Station an improved technic has made it possible to demonstrate the presence of coccidia in the feces of healthy cattle. The data presented are considered to justify the conclusion that coccidia are normal inhabitants of the intestines of young cattle in the northwestern States, and that clinical coccidiosis develops as the result of the effect of environmental factors in lowering the resistance of the hosts to the parasites. Reference is made to a contribution by Skidmore (E. S. R., 71, p. 243) which reports finding coccidia in the feces of cattle with no clinical symptoms although from a herd in which coccidiosis had occurred over a period of 6 yr.

Resistance of sheep of different breeds to infestation by Ostertagia circumcincta, M. A. Stewart, R. F. Miller, and J. R. Douglas (*Jour. Agr. Res. [U. S.], 55 (1937), No. 12, pp. 923–930, figs. 2*).—In the course of work conducted by the California Experiment Station, the details of which are given in four tables, a group of 29 lambs, representing 5 breeds and 3 cross-bred individuals, was isolated and kept for 12 mo. on an irrigated pasture, where they were continuously exposed to infection from *O. circumcincta* (Stad.). Egg counts, by a modification of Caldwell's method, were made regularly every 2 weeks throughout the period. Such counts were used as an indicator to determine relative resistance or susceptibility. The data thus obtained were statistically analyzed by Fisher's pairing method.

"From these analyses it was shown that the different breeds vary in susceptibility to the parasite in the following ascending order: Romney, Rambouillet, Southdown, Shropshire, and Hampshire, the last three breeds possessing a susceptibility of approximately the same magnitude. The Romneys are outstandingly resistant.

"Further statistical analysis showed that in each of the more susceptible breeds there are significant differences in susceptibility, but in the Romneys there are no significant differences between individuals. Still further analysis demonstrated that the great majority of the more resistant individuals of the more susceptible breeds possess a resistance of approximately the same magnitude as the mean of that of the Romney. Since this is true, it is theoretically possible for a breeder to develop a resistant strain within any of the more susceptible breeds investi-

gated without running the risk of sacrificing a characteristic of some particular breed which he wants to maintain."

The cultural characteristics of Erysipelothrix rhusiopathiae, A. G. KARLSON (*Jour. Bact., 35 (1938), No. 2, pp. 205, 206*).—A review of the literature has indicated much disagreement regarding the cultural and biochemic characteristics of the swine erysipelas organism. A study made by the author of 52 cultures revealed little variation between strains.

Further studies on intestinal emphysema of swine, D. F. EVELETH and H. E. BIESTER (*Amer. Jour. Hyg., 27 (1938), No. 2, pp. 364–369, figs. 2*).—The work reported has shown that intestinal emphysema in swine, which is a gaseous distention of the lymphatics of the intestinal wall and mesentery, is the result, in experimentally produced cases, of a dietary deficiency. "Whole corn, unpolished rice, skim milk powder, and yeast contain the antiemphysema factor. Skim milk powder as 20 percent of the ration does not protect swine, but when increased to 50 percent protection is furnished. A ration of 5 percent yeast, 20 percent skim milk powder, and 75 percent polished rice protected four of five pigs from emphysema. Rations must contain sufficient vitamin B_1 to support growth of about 0.5 lb. per day for the experimental production of intestinal emphysema."

Transmission of the virus of equine encephalomyelitis by Aedes taeniorhynchus, R. A. KELSER (*Jour. Amer. Vet. Med. Assoc., 92 (1938), No. 2, pp. 195–203*).—The mosquito *A. taeniorhynchus* has been found in the course of studies in the Canal Zone to be capable of transmitting the western type of encephalomyelitis virus from guinea pig to guinea pig. Such transmission by the mosquito is not mechanical but occurs after multiplication, maturation, or, less probably, cyclic change of the virus within its body. The period of time necessary for the ingested virus to become infective appears to be longer in *A. taeniorhynchus* than when ingested by some other species of *Aedes* mosquito, especially the yellow-fever mosquito. The evidence obtained indicates that once this mosquito has become fully infective it will readily transmit the disease to guinea pigs with fatal results within a few days. A single mosquito biting a normal guinea pig but once produced encephalomyelitis and death of the pig in 5 days. The mosquito proved infective during the 32 days that it was possible to keep it alive in the laboratory.

Studies of recurrent ophthalmia of horses, E. L. STUBBS and H. RATCLIFFE (*Penn. Univ., Vet. Ext. Quart. No. 69 (1938), pp. 3–12*).—Bacteria-free filtrate of the fluids and tissues of the eyes of horses which exhibited the acute stages of recurrent ophthalmia, when injected into the vitreous body of normal horses, caused prompt development of changes that correspond to the acute phases of the spontaneous disease. Such material was passed in series through three groups of horses, and in each group the signs of acute recurrent ophthalmia developed. This material when inoculated into the vitreous body of rabbits caused the development of retinitis with exudate into the posterior chamber of the eye, and this condition was reproduced in rabbits through six transfer groups. Injection of filtrate from the eyes of the last group of rabbits into the vitreous body of three horses was followed by the development of changes that were more or less comparable to the spontaneous disease.

Moldy corn poisoning in horses, L. H. SCHWARTE (*Jour. Amer. Vet. Med. Assoc., 92 (1938), No. 2, pp. 152–157, figs. 2*).—A brief review of moldy corn poisoning in horses, together with a report of field cases and the reproduction of this condition by carefully controlled experiments, is presented. A description is given of its seasonal occurrence in Iowa, the typical lesions, and pathologic tissue changes, making it possible to differentiate moldy corn poisoning from

other conditions manifesting similar clinical symptoms. Suitable measures for the prevention and treatment of this condition which have proved to be the most effective are considered.

Piroplasmosis of the domestic cat, J. McNeil (*Jour. So. African Vet. Med. Assoc., 8 (1937), No. 2, pp. 88–90*).—The author concludes that the disease of the cat due to *Piroplasma canis* is transmitted by the adult of a tick (*Haemaphysalis leachi*) and not by its immature stages. The wildcat (*Felis caffra*), which is found in great numbers in South Africa, is thought to be the reservoir of this *Piroplasma*.

Problems in poultry disease mortality, C. P. Fitch (*U. S. Egg and Poultry Mag., 44 (1938), No. 2, pp. 91, 124, 125*).—A discussion of the problems in poultry disease mortality. It deals particularly with that due to avian tuberculosis, which is prevalent in the northwestern States, surveys made in Minnesota, Iowa, and Illinois indicating that from 50 to 75 percent of the flocks have some infected birds.

Investigation of septicemic diseases among fowls in North Carolina, R. S. Dearstyne, R. E. Greaves, and H. C. Gauger (*North Carolina Sta. Rpt. 1935, pp. 55, 56*).—Brief reference is made (E. S. R., 78, p. 256) to the progress of a study of the relative effects of mercurophen and of phenol, when used as preservatives for avian typhoid bacterin, on antibodies and the possible anaphylactic shock produced, laboratory studies of adult carriers of avian typhoid, and a measurement of the dissociation of certain strains of *Salmonella pullorum* brought about by laboratory transferring and the relationship of agglutinability to types encountered.

Fowl leukemia and vitamin E.—A preliminary report, W. J. Butler and D. M. Warren (*Jour. Amer. Vet. Med. Assoc., 92 (1938), No. 2, pp. 204–206*).—A brief preliminary report is made of the therapeutic value of vitamin E in the treatment of fowl leukemia. For this purpose, cold-pressed wheat-germ oil was injected hypodermically into the breasts of several affected pullets. At first 2 cc of oil was injected, but after a number of experiments the quantity was reduced to 1 cc. Such treatment was found to result in a quick recovery from paralysis. Apparently the injection of wheat-germ oil checks the leucocytic infiltration and may direct its resorption so as to release the fibers of nerves entrenched in its meshes.

Some factors influencing the transmission of fowl paralysis, J. K. Williams, E. M. Gildow, and C. E. Lampman (*U. S. Egg and Poultry Mag., 44 (1938), No. 1, pp. 24–27, fig. 1*).—Data are presented which supplement the earlier report (E. S. R., 76, p. 107).

The whole blood agglutination test for pullorum disease, H. J. Stafseth (*Vet. Med., 33 (1938), No. 1, pp. 6–9*).—The whole blood agglutination test for pullorum disease is said to have proved satisfactory in eliminating pullorum infection from flocks in Michigan.

The agglutination test for detecting Salmonella pullorum infection in chicks, R. D. Reid (*Jour. Bact., 35 (1938), No. 1, p. 62*).—The results of a study conducted in Idaho, an abstract of which is presented, indicate that the whole blood method may, under proper conditions, be relied upon to detect most, if not all, of the carriers of *S. pullorum* and may be valuable in a control program. It is further indicated that reactors can be detected before the birds reach production age.

Further studies on IV-variants of Salmonella typhi-murium (aertrycke), with special reference to cultures from pigeons, P. R. Edwards (*Jour. Bact., 35 (1938), No. 2, pp. 123–128*).—In further studies (E. S. R., 77, p. 395) by the Kentucky Experiment Station which included 155 cultures of *S. typhimurium* of

animal origin, the only IV-variants encountered were isolated from pigeons and from rabbits which had contact with infected pigeons. Thirty-five cultures from pigeons all belonged to the IV-variety which is enzootic in pigeons in the United States. The occurrence of IV-variants of *S. typhimurium* in food poisoning indicates that the infection was contracted directly or indirectly from pigeons. A list is given of 12 references to the literature.

Aegyptianellosis and leg-weakness of the goose, J. D. W. A. Coles (*Jour. So. African Vet. Med. Assoc., 8 (1937), No. 2, pp. 98–100*).—A description is given of an affection in two geese due to *Aegyptianella pullorum*. In one case the organism was transmitted successfully to two ducks, both of which succumbed. Both of the geese showed pronounced leg weakness, but evidence was obtained which indicated that aegyptianellosis and paralysis are two separate conditions transmitted by the fowl tick.

The evaluation of nesting losses and juvenile mortality of the ring-necked pheasant, P. L. Errington and F. N. Hamerstrom, Jr. (*Jour. Wildlife Mangt., 1 (1937), No. 1–2, pp. 3–20, fig. 1*).—This contribution from the Iowa Experiment Station, based upon earlier work (E. S. R., 75, p. 73), summarizes data on pheasant nests, periods at which laying begins, juvenile mortality, and the significance of findings from the standpoint of management, the details being given in tables and a graph.

Wisconsin pheasant movement study, 1936–37, A. Leopold, O. S. Lee, and H. G. Anderson (*Jour. Wildlife Mangt., 2 (1938), No. 1, pp. 3–12, fig. 1*).—It is concluded that wild pheasants trapped in winter from managed refuges may be cheaper and better than artificial pheasants for replenishing understocked range. A study of 210 such pheasants trapped, marked, and released under selected conditions in southern Wisconsin during January 1937 has shown that where food and cover were good and coverts of ample size there was no dispersion; where food was good but coverts small and scattered, the released birds held well in some instances and in others they (and also the resident birds) adopted a circuit type of ranging similar to that of the large carnivores; and where food and cover were both poor, dispersion was immediate and complete. A list is given of 10 references to the literature.

AGRICULTURAL ENGINEERING

[Agricultural engineering investigations by the Cornell Station] (*[New York] Cornell Sta. Rpt. 1937, pp. 94–97*).—A brief historical review is presented of investigations on spraying equipment, dairy and poultry structure illumination and ventilation, and related subjects.

[Agricultural engineering investigations by the Texas Station], H. P. Smith, D. T. Killough, D. L. Jones, J. J. Taubenhaus, G. E. Altstatt, W. H. Dameron, and E. B. Deeter (*Texas Sta. Rpt. 1936, pp. 156–158, 159–161*).—The progress results are briefly presented of investigations on mechanical harvesting of cotton, factors of efficiency in the distribution and placement of cottonseed and fertilizers, planting of cottonseed at variable and uniform depths, the use of the rubber press wheel, width of furrow openers, garlic drying, and eradication of pricklypear and mesquite brush.

Report of the Chief of the Bureau of Public Roads, 1937, T. H. MacDonald (*U. S. Dept. Agr., Bur. Public Roads Rpt., 1937, pp. 73*).—This report describes the activities of the Bureau during 1937. Under the physical research program of the Bureau, data are reported on investigations of concrete pavement design and corrugated metal culverts, and on portland cements, aggregates, and concrete, including resistance to calcium and sodium chlorides.

Public Roads, [March 1938] (*U. S. Dept. Agr., Public Roads, 19 (1938), No. 1, pp. [2]+16+[2], figs. 9*).—This number of this periodical contains data

on the current status of the various highway projects receiving Federal funds as of February 28, 1938, and the following articles: Financing of Local Roads and Streets (pp. 1–8); Snow Removal and Ice Treatment on Rural Highways, by H. A. Radzikowski (pp. 9–13); and Automobile Purchases by Farm Families (pp. 13–15).

Technique in mapping as related to land use, as developed for the Rio Grande joint investigation, F. C. Scobey (*Agr. Engin., 18 (1937), No. 9, pp. 397–401, figs. 4*).—This technic and procedure are described in detail.

Drop inlet soil saving dams, E. R. Jones (*Agr. Engin., 18 (1937), No. 8, pp. 349–351, figs. 3; 9, pp. 407–411, 413, figs. 9*).—This contribution from the Wisconsin Experiment Station goes intimately into the technical details of the design of drop inlet soil-saving structures.

Contour furrows simplified, E. V. Collins and M. W. Bloom (*Agr. Engin., 18 (1937), No. 9, p. 402, figs. 4*).—In a brief contribution from the Iowa Experiment Station a machine is described the purpose of which is to build contour ridges in sodded pastures without destroying any of the sod and leaving a minimum of unsodded earth exposed. Right and left furrow slices are cut and lifted but are not broken away at the outer edges. The right-hand blade cuts 4 in. deeper than the left. A moldboard or turning plow following the left blade and working underneath the lifted furrow slice cuts 4 in. deeper than the left blade and throws its furrow slice under the right-hand sod strip. This supports the right-hand sod strip at a sharp angle and permits the left sod strip to fall into a position about 3 in. lower than its original position.

Implements and methods of tillage to control soil blowing on the northern Great Plains, J. S. Cole and G. W. Morgan (*U. S. Dept. Agr., Farmers' Bul. 1797 (1938), pp. II+21, figs. 12*).—Practical information is given.

Comparative durability of shingles and shingle nails, J. A. Ferguson (*Pennsylvania Sta. Bul. 353 (1938), pp. [2]+25, figs. 13*).—On a 25-yr. test at State College, Pa., shingles of perishable woods that were given a preservative treatment with creosote were more durable than shingles of the more durable woods not creosoted, while this preservative treatment materially lengthened the life of shingles of durable woods. Through its tendency to exclude moisture, a preservative treatment with creosote betters the physical properties of wood when used as shingles; there is less warping and splitting of the shingles and less surface weathering. Shingle nails last longer with shingles that have been given a preservative treatment; this lengthens the life of a shingle roof. Shingles made from western red cedar and redwood were durable for 25 yr. even when untreated, those from treated southern yellow pine were fully as durable as those from untreated western red cedar and redwood, those from Pennsylvania pitch pine were not durable even when treated, and those from Pennsylvania chestnut were durable when treated.

The life of either blue cut and wire nails was at least equal to the life of western red cedar shingles. Such slight differences in the rust resistance of blue cut nails and wire nails as existed were probably due to differences in composition of the iron used in manufacturing the nails. Blue cut nails were slightly more rust-resistant than wire nails. The rapid rusting of shingle nails used with a western red cedar roof was caused by rain water that came in contact with the nails, due to splits or decay in overlapping shingles.

Patching wooden shingle roofs to correct splits or decay will greatly prolong their useful life. The proper placing of nails in laying a wooden shingle roof will prevent in large measure the loosening and blowing of shingles from a roof.

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It is stated that the results of this test apply only to regions having atmospheric conditions similar to those at State College, where the air is remarkably free from impurities.

Lag-screw joints: Their behavior and design, J. A. Newlin and J. M. Gahagan (*U. S. Dept. Agr., Tech. Bul. 597 (1938), pp. 27, figs. 16*).—The purpose of this bulletin is to present the results of numerous lag-screw tests recently made at the Forest Products Laboratory in cooperation with the University of Wisconsin as a part of a more general investigation of wood joints and fastenings. The lag screws used were of the machine-threaded type with a root diameter of thread approximately three-fourths that of the shank or unthreaded portion. They differed widely in quality of metal and in over-all length, and also in the relative length of shank and threaded portion, particularly among the various sizes. Seasoned material of both coniferous and hardwood species were used in the study.

It was found that in assembling wooden members with lag screws it is essential to use prebored holes except for the smaller screws in the softer species, and even there it is considered good practice. The lead hole for the entire shank should be of the same diameter as the shank. The recommended diameter of lead hole for the threaded portion in northern white pine is from 40 to 70 percent of the shank diameter of the screw, in Douglas fir and southern yellow pine from 60 to 75 percent, and in white oak from 65 to 85 percent of the shank diameter. The larger figure in each range applies to screws of the greater diameters. Soap or other lubricant should be used on the screws, particularly with the denser species, to facilitate driving and prevent damage to the screw. Lead holes slightly larger than those recommended for maximum efficiency should be used with lag screws of excessive length.

The resistance to direct withdrawal of lag screws varies about as the 3/4 power of the shank diameter of the screws, about as the 3/2 power of the specific gravity of the wood into which they are driven, and directly as the depth of contact of the threaded portion. A depth greater than 7 times the shank diameter of the screw in the denser species and from 10 to 12 times in the softer species would develop a resistance approximately as great as the ultimate tensile strength of the screw.

The resistance to withdrawal of a lag screw from an end-grain surface is about three-fourths as great as from a side-grain surface of the same piece.

The resistance to lateral displacement of a lag screw bearing parallel to the grain of the wood varies about as the square root of the crushing strength of the wood along the grain and as the 3/4 power of its specific gravity. It also varies as the square of the shank diameter of the lag screw and about as the square root of the yield-point stress of the metal.

A cleat-thickness ratio below about 3.5 to 1 gives more or less erratic proportional limit loads. For ratios from 3.5 to 1 up to about 7 to 1 there is a considerable increase in proportional limit loads, but beyond this ratio the rate of increase in strength drops very rapidly.

Laminated rafters for farm buildings, H. H. Musselman (*Michigan Sta. Quart. Bul., 20 (1938), No. 3, pp. 163–169, figs. 5*).—The technical details of laminated rafter roof construction are briefly described. Tests on cable reinforcing are briefly reported, indicating that on a one-sixth size model great advantage was secured from reinforcing in reduced roof distortion.

Seal coats for bituminous surfaces, A. R. Legault (*Colorado Sta. Bul. 440 (1937), pp. 22, figs. 9*).—The results of service tests of seal coats are reported, these being mainly with commercial materials. The findings are largely relative to the service character of the materials.

A comparison of various treatments of cement and steel wine-tank surfaces, W. V. Cruess, T. Scott, H. B. Smith, and L. M. Cash (*Food Res., 2 (1937), No. 5, pp. 385–396*).—In studies conducted at the California Experiment Station, wines dissolved but little iron from concretes made of 22 different cements, some of which were very high in Fe_2O_3. In white dry wine, however, enough iron was dissolved in some cases probably to render the wine unstable with respect to clouding. The calcium pick-up was high with all free cement surfaces, and the problem appears to be one of protection of the concrete against dissolving of calcium rather than of iron. Treatment of the concrete surface with strong tartaric acid solution greatly reduced the amount of calcium dissolved by the wine. Two treatments, one with 0.5-percent and one with 25-percent solution, gave better protection than one treatment with 25-percent solution. A coating of insoluble calcium tartrate is formed. Of the commercial preparations tested, Pioneer Flintkote asphalt emulsion and Bass-Hueter black enamel gave the best results. Beer pitches and experimental mixtures of melted beeswax, paraffin, and rosin blistered badly and gave very little protection. Water-glass coatings failed to adhere satisfactorily, or did not prevent excessive reaction between the wine and concrete. Gilsonite 25 percent plus paraffin 75 percent gave a highly protective coating and it is inexpensive and easily applied, but it is somewhat more brittle than the asphalt-emulsion coating. The tests of coatings for steel were less extensive than with concrete, but of the coatings tested a Gilsonite-paraffin mixture and Bass-Hueter black enamel gave the best results. Asphalt emulsion appeared very promising in qualitative tests.

Corrosion of metals by musts and wines, E. M. Mrak, D. C. Caudron, and L. Cash (*Food Res., 2 (1937), No. 5, pp. 439–454*).—In tests conducted by the California Experiment Station with 46 metals and alloys, the stainless steels, Inconel, and Aluminum-alloy 76 were the most resistant and cast iron, steel, tin, Niresist, and nickel the least resistant metals. The metallized metals and Durimetl were resistant, but this may have been due to tartrate deposits. Corrosion was most severe at the crushers, but the filter charger also exerted a strong corrosive action on most metals and alloys because of agitation, aeration, and erosion. Metals exposed under the white crusher were usually more heavily corroded than when exposed under the red crusher. The white fermenter was more corrosive than the red fermenter. The addition of SO_2 during fermentation increased corrosion in some instances and decreased it in others. White juices or wines were usually more corrosive than the red juices or wines. Monel metal, nickel, nickel plate, silver, and silver plate corroded more at the red crusher, but these differences were not consistent in all tests.

Corrosion of metals by some motor fuels, A. L. Teodoro and J. P. Mamisao (*Philippine Agr., 26 (1938), No. 9, pp. 774–787, figs. 3*).—This paper presents data on the effect of alcohol, gasoline, kerosene, and other motor fuels on some metals that are used in the fuel feed systems of internal-combustion engines, namely, mild steel, cast iron, aluminum, lead, copper, and galvanized iron. They all measured about 5 by 5 by 0.65 cm, except galvanized iron, which was 0.1 cm thick. Immersions were made for periods covering 100 days (two trials), 200 days, and 350 days.

Mild steel and cast iron were readily and heavily corroded by ether, showing signs of rusting soon after corrosion started. Corrosion of these metals by the alcohol fuels showed that the higher the water content of the fuel the greater the corrosion. Alcohol fuels containing ether as an admixture were highly corrosive to these metals. Aluminum was heavily corroded by methyl alcohol,

and was easily attacked by alcohol fuels and by fuels containing alcohol as an admixture. When corroded it forms a jellylike substance which may clog the fuel passageways and carburetor jets. Lead was heavily attacked by ether and by methyl alcohol and corroded by all the fuels used in the test. Copper was the least affected by corrosion of any metal tested. Galvanized iron was corroded by all the fuels used except benzine. It was heavily attacked by ether and by alcohol fuels, especially those containing gasoline and ether as admixtures.

Tractor fuels in relation to tractor operating costs, F. W. Duffee (*Agr. Engin., 18 (1937), No. 8, pp. 352–354, figs. 6*).—According to a brief contribution from the Wisconsin Experiment Station, where uniformly steady loads equaling or exceeding from 60 to 70 percent of the maximum horsepower of the engine prevail light straw-colored distillate of good grade having a maximum or end point of not over about 525° F. should be used. These recommendations apply to modern tractors equipped with good manifolding for the burning of heavy fuel and where provision is made for proper control of the engine temperature so as to maintain the temperature of the cooling liquid above approximately 200°. Kerosene is not recommended where distillate with a maximum of not over 525° and otherwise of suitable grade for tractor operation is available, principally because distillate is cheaper and has a much better octane rating and will make for smoother operation of the engine. Where the load on the engine is less than 60 or 70 percent of the maximum horsepower or where the loads are irregular or vary, as for example in the case of operating a silage cutter, gasoline is recommended. If the job is such that rather frequent starting of the engine is necessary it should be operated on gasoline. If the tractor is small and not used a large number of hours per year, the exclusive use of gasoline is recommended, as there will be less bother in handling and the savings from using distillate would not be great.

Effects of feeds and saw speeds on cotton turn-out and quality, C. A. Bennett and F. L. Gerdes (*U. S. Dept. Agr. Leaflet 151 (1937), pp. 4, fig. 1*).—Practical information on the subject is given, based on tests at the U. S. D. A. Cotton Ginning Laboratories, Stoneville, Miss., and continuing earlier work (E. S. R., 75, p. 117).

A flax seed plot thresher, R. Bainer and J. S. Winters (*Agr. Engin., 18 (1937), No. 8, pp. 363, 364, figs. 2*).—A brief description is given of a flax thresher for threshing seed plats which was developed by the California Experiment Station. The thresher consists of a feed table, two rubber-covered steel rolls, and a cleaning shoe of somewhat standard construction. The machine is fed by hand, and the tailings from the shoe are returned by hand to the rolls for threshing. A 2-hp. air-cooled engine furnishes power for operating the machine. The upper roll is mounted in bearings which are in turn mounted in guides. This permits the upper roll to raise when wads of flax straw pass through.

Recent progress in forage drying, W. M. Hurst (*Agr. Engin., 18 (1937), No. 11, pp. 499–501*).—This brief contribution from the U. S. D. A. Bureau of Agricultural Engineering deals mainly with progress in artificial drying.

Design and performance of a small automatic hammer mill, A. T. Hendrix (*Agr. Engin., 18 (1937), No. 10, pp. 445–447, 450, figs. 6*).—Investigations conducted by the University of Tennessee in cooperation with the Tennessee Valley Authority are reported. Two mills were constructed as complete units, of the swing-hammer type, having specially designed hammers carried by rods passing through holes located near the periphery of circular disks. The disks, three in number, were clamped on the mill shaft by spacers and a clamp nut.

Each mill had 180° of screen arc, 10-in. swing, tangential feed, and was equipped with a fan. Neither of the mills had automatic feed. One mill was 4 in. wide and the other 2 in. wide.

It was found that for satisfactory operation of a small capacity hammer mill a fan is not necessary, and for general grinding no considerable gain in capacity or efficiency is obtained. The most satisfactory speed for grinding with a hammer mill of the type used, with 10-in. swing, is about 3,750 r. p. m., but depends somewhat on the material being ground and on the fineness of grinding desired. The lighter the material and the finer the grinding, the greater the desired speed. A mill 4 in. wide is preferable to a mill 2 in. wide when using either a ½-hp. or 1-hp. motor because of more satisfactory operation, greater mechanical stability, and better accessibility. Finer grinding is obtained for given material and conditions with finer screen, higher speed, and greater number of hammers. To be satisfactory any small grinder must be at least semiautomatic in operation.

On this basis a small hammer mill was developed, 4 in. wide, with 11-in. swing, and of the conventional swing-hammer type, with 10 hammers. The hammers are suspended on rods passing through circular disks. The disks are clamped on the mill shaft, which in turn is carried by two double-row, self-aligning ball bearings. The mill has semiautomatic tangential feed. The screen, which is semicircular, thus giving 180° of screen arc, is readily replaceable. The mill may be belt driven, or it may be direct connected to a 3,600-r. p. m., ½- to 1-hp. motor.

In addition to grinding oats and shelled corn, these hammer mills were used for grinding barley and other small grains for stock feed. Test runs were made as to the practicability of grinding several other materials such as soybeans, cane seed, lespedeza seed screenings, tankage, and oystershells for chicken mash. The grinding of corn meal and whole wheat flour for use in the home was also tried, and the results were favorable. No trouble was experienced with clogged screens.

While these small hammer mills do not have as high efficiencies as do large grinding units, their efficiency has been shown to be equal to any other type mill of equal capacity and power. The advantages of a small investment grinder to the farmer who can use this size would probably more than offset the lower efficiency due to lower capacity.

1937 report of the Rural Electrification Administration, J. M. Carmody (*Rural Electrif. Admin. [U. S.] Rpt., 1937, pp. VIII+135, pls. 14, figs. 6*).—This report describes the activities for 1937, drawing attention to the fact that rural electric service reached approximately 250,000 additional farm people during the year. This brought the total number of farms now having electric service to 1,200,000 and the total number of projects now financed by the Rural Electrification Administration to 120, spread over 40 States. Eighteen States enacted new legislation to aid the initiation and operation of these projects.

Electric pig brooders, J. R. Tavernetti and E. H. Hughes (*California Sta. Bul. 618 (1937), pp. 8, figs. 2*).—This bulletin reports investigations conducted in cooperation with the California Committee on the Relation of Electricity to Agriculture. These included a series of trials to determine the practicability of electric pig brooders, made during the spring farrowing seasons of 1935–37.

Electric pig brooders were successful in reducing the loss of pigs during the first 10 days after birth. In 3 years' trials the loss was reduced about 50 percent. Practically no difference in results was obtained with the two types of brooders used, namely, underheat and radiant, but the latter had certain advantages in cost and operation. The initial and operating costs of the brooders was low enough to make their use economically feasible.

Electrical heating for horticultural purposes, C. A. CAMERON BROWN (Jour. Min. Agr. [Gt. Brit.], 44 (1937), No. 6, pp. 552–561).—In a brief contribution from the Institute for Research in Agricultural Engineering of the University of Oxford data and technical details are presented on glass house and soil heating by electricity.

Insulation under high humidity conditions, A. D. EDGAR (Agr. Engin., 18 (1937), No. 8, pp. 359, 361).—The results of investigations on the storage of white potatoes in Maine as they relate to the efficacy of insulation under high humidity conditions are briefly reported as a contribution from the U. S. D. A. Bureau of Agricultural Engineering.

Fill type insulation has been found most practical for these storages because it costs less to obtain the needed amount. Rock wool fill insulation sandwiched between two layers of reinforced waterproof paper absorbed moisture equal to 10 percent of its dry weight at the end of the storage season. When the same walls were provided with a ⅝-in. auger hole in the plate for a breather, to the cold air, at the top of each wall section 16 in. wide by 24 in. high, the insulation absorbed moisture equal to only 3.5 percent of its dry weight at the end of the storage season.

The use of insulation is generally justified upon the basis of savings in heating or refrigerating. Increasing the wall and ceiling insulation resistance from 5 to 20 resulted in a fuel saving of 0.8 ct. per square foot per season. Due to higher storage humidity maintained in the better insulated houses and reduced potato shrinkage, the additional value of marketable potatoes at the end of the season amounted to about 2.6 ct. per square foot of wall and ceiling area for the season. The savings of potatoes were thus practically three times the savings in fuel and, together, amounted to about 3 ct. per year per square foot of wall and ceiling area where the storage remains filled for a full 210-day storage period. For average storages where potatoes are shipped intermittently between the second and seventh months a probable annual return of from 1.5 to 2 ct. per square foot of wall or ceiling area will result from increasing their insulation resistance from 5 to 20.

By careful application an insulating resistance of 20 can be secured by the use of commercial fill insulation at about the same cost as a resistance of 10 could be secured with board or blanket type insulation.

Fill type insulation is suitable for storage only when there is a one-way temperature difference, that is, where it is practically always either warmer or colder on the same side of the wall. For instance, it would not seem to fit the New England apple storage problem where it is desirable to refrigerate in the fall and heat in the winter.

AGRICULTURAL ECONOMICS

[Papers and notes on agricultural economics] (Jour. Farm Econ., 19 (1937), Nos. 3, pp. 681–817, figs. 8; 4, pp. 845–954, fig. 1).—No. 3 includes abstracts prepared by W. J. Roth of papers by E. H. Reed, M. H. Cohee, P. E. Johnston, P. Nelson, and G. A. Pond on farm management as related to conservation programs, and abstracts prepared by C. F. Sarle of papers by E. W. Braun and A. Sturges on price analysis as a guide in marketing control, all presented at round table sessions at the twenty-seventh annual meeting of the American Farm Economic Association (E. S. R., 78, p. 263). Other papers are included as follows: A Generalization of the Theory of Imperfect Competition, by G. J. Stigler (pp. 707–717); Mathematics in Economics, by J. M. Thompson (pp. 718–726); Expenditures of Local Governments, by C. H. Hammar (pp. 727–740); Reorganization of Counties, by H. C. Bradshaw (pp. 741–

749); Why the Dust Bowl? by P. H. Stephens (pp. 750–757); Forests in a Land-Use Program, by R. K. Winters (pp. 758–763); Farm Mortgage Loan Repayment—A Survey of Existing Plans and Some Possible Alternatives, by J. K. Galbraith, R. M. Macy, and W. Malenbaum (pp. 764–782); Mutual Fire Insurance Companies, by R. Russell (pp. 783–790); and Professional Improvement, by R. L. Mighell (pp. 791–799). In addition, articles and notes are included on Gainful Workers in the Rural Farm Population, by G. M. Peterson (pp. 800–802); Nonfarm and Farm Employment of Persons Living on Farms, by R. H. Allen (pp. 802–804); The Quality of Grain Crops, by W. B. Garver (pp. 804–808); Indiana Enumerations, United States Census and Assessors', by M. M. Justin (pp. 808–811); The Economic Production of Eggs in Delaware, by R. O. Bausman (pp. 811–814); and The Normal White Share-Cropper Family With Grown Children, by D. Dickins (pp. 814–817).

No. 4 includes papers on Tariff Theory, by W. A. Morton (pp. 845–860); Observations on Agricultural Policy, by J. S. Davis (pp. 861–877); Bases of Computing Patronage Dividends of Cooperative Cotton Gins, by W. E. Paulson and R. T. Baggett (pp. 878–885); Price Interrelationships, by H. J. Henney (pp. 886–891); A Suggested Adjustment in the Farm Tenancy System, by M. D. Harris (pp. 892–900); A study of National Farm Loan Associations in the Fourth Federal Land Bank District, by E. L. Butz (pp. 901–912); Farm Labor, by R. L. Adams (pp. 913–925); Measurement and Correction of Assessment Inequalities on Agricultural Lands in Montana, by R. R. Renne and H. H. Lord (pp. 926–934); State Ownership of School Lands in Selected Areas in Colorado and Nebraska, by R. C. Whitney (pp. 935–943); and Marketing New York Apples, by G. P. Scoville (pp. 944–949); and notes on What a Tariff Study Should Reveal, by B. H. Hibbard (pp. 950, 951), and Methods and Objectives in Type of Farming Investigations, by M. H. Saunderson and N. W. Johnson (pp. 952–954).

[Proceedings of the ninth and tenth annual meetings of the Western Farm Economics Association] (*West. Farm Econ. Assoc. Proc., 9 (1936), pp. [4]+188, figs. 11; 10 (1937), pp. [4]+210, figs. 4*).—Included are the following papers presented at the ninth annual meeting, held at Laramie, Wyo., July 30 to August 1, 1936; Observations on Farm Management Research and the Use of the Results, by C. L. Holmes (pp. 7–13); Some Observations of Farm Management Work, by G. W. Kuhlman (pp. 14–21); Agricultural Conservation and Farm Management Problems in Washington, by B. H. Pubols (pp. 22–26); Selected Population Problems of the Western States in Relation to Agricultural Adjustment, by P. H. Landis (pp. 27–41); Standards of Living During the Period of Agricultural Adjustment, by C. F. Kraenzel (pp. 42–49); Rural Relief and Agricultural Adjustment, by O. F. Larson (pp. 50–63); Agriculture's Share of the National Income, by G. M. Peterson (pp. 64–70); International Trade in the Recovery Program, by J. S. Davis (pp. 71–79); Mathematics in Economics, by J. M. Thompson (pp. 80–86); The Relation of A. A. A. Reductions to Gold Prices and Purchasing Power, by P. A. Eke (pp. 87–104); Agricultural Adjustment and Livestock Production in the Northern Great Plains Region, by M. H. Saunderson (pp. 105–110); Adjusting Forest Service and Public Domain Permits to Land Ownership, by R. T. Burdick (pp. 111–113); Western Grazing Problems, by W. R. Chapline (pp. 114–124); Profitable Systems of Farm and Ranch Organization for Dry Land Areas of Wyoming, by A. F. Vass (pp. 125–144); Research for Land-Use Adjustment, by W. P. Thomas (pp. 145–150); Some Phases of the Land Utilization Program, by R. E. Willard (pp. 151–157); Research in the Rural Institutional Aspects of Agricultural Adjustment, by R. R. Renne (pp. 158–168); Land Abuse or Land Use, by W. A. Rockie (pp.

169–175); The County Agricultural Adjustment Planning Project, by L. M. Vaughan (pp. 176–179); and The 1936 Agricultural Conservation Program, by G. E. Farrell (pp. 180–182).

At the tenth meeting, held at Reno, Nev., June 24–26, 1937, four main topics—agricultural policy, agricultural income, farm labor, and small farms—were discussed in detail, and round table sessions were held on inflation, teaching and research programs in agricultural economics, and range livestock research. The principal papers, with discussions, were as follows: Observations on Agricultural Policy, by J. S. Davis (pp. 5–20); Income Parity for Persons on Farms, by O. C. Stine (pp. 35–44); Farm Labor, by R. L. Adams (pp. 66–78); The Small Farm, by E. G. Peterson (pp. 102–118); Inflation and Agriculture, by J. M. Tinley (pp. 142–146); Range and Livestock Investigative Work, by C. E. Favre (pp. 147–162); and Teaching and Research Programs in Agricultural Economics in the Eleven Western States, by R. R. Renne (pp. 165–181).

[Papers presented before the British Agricultural Economics Society] (*Jour. Proc. Agr. Econ. Soc., 4 (1937), No. 4, pp. 263–321; 5 (1937), No. 1, pp. 17–102*).—These reports continue the series previously noted (E. S. R., 77, p. 711). The following papers, with discussions, are included: No. 4, Conference at London, December 8 and 9, 1936—The Cattle and Beef Situation, by E. L. Harry (pp. 263–287); Rural Organization in the United States, by C. C. Taylor (pp. 288–298); and Some Sociological Aspects of Farm Labour in North Northumberland, by R. Henderson (pp. 299–321); and No. 1, Conference at Cambridge, July 2–5, 1937—Presidential Address—The Evolution of the Rights of the Tenant, by A. G. Ruston (pp. 17–42); New Zealand's Farm Products Marketing Plan, by R. M. Campbell (pp. 43–57); Output and Efficiency—An Examination of Some Standards, by M. A. Knox (pp. 58–72); Contemporary Efforts on Behalf of Agricultural Workers, by L. E. Howard (pp. 73–91); and Agriculture and Foreign Investment, by A. H. Brown (pp. 92–102).

[Investigations in agricultural economics by the Maine Station, 1936–37] (*Maine Sta. Bul. 387 (1937), pp. 185–194, 214–224*).—Records on milk production and distribution costs for the year ended April 30, 1936, were gathered in seven market areas by G. F. Dow and A. E. Watson from 140 milk distributors of whom 131 were also producers. Tables are also included and discussed showing the average costs of production and returns other than milk per cow and per hundredweight of 4 percent milk in seven districts; the average production per cow and cost per quart in each district; the relation of annual production per cow to the average amounts of grain and hay equivalent fed, total feed cost, and cost of man labor per cow and per hundredweight of 4 percent milk; and the relation of number of cows per herd to the amount of labor and cost of milk production. Other tables show the average value of sales of milk, cream, and miscellaneous products, the cost of products, distribution costs, and net profit for the 140 distributors, and make comparisons between the seven districts; the relation of total annual sales to income and expenses; and by items the average plant, container, selling, and administrative costs for 139 raw milk dealers.

Tables by W. E. Schrumpf make comparisons (averages for 1929 and 1930) for the costs per acre by items of growing, harvesting, storing, and selling potatoes in central Maine and in the Presque Isle area. Other tables show for 1930 for the central Maine area the relations of combined growing and harvesting costs to yield rate and cost of selling to amount sold. Other tables by Schrumpf compare for 1928–30 and 1935 the land use, acreages in different crops, numbers of different kinds of livestock, and distribution of capital on potato farms in Aroostook County.

[Investigations in agricultural economics by the Cornell Station (*[New York] Cornell Sta. Rpt. 1937, pp. 91–94*).—Brief general findings are reported for cost accounting and other financial studies, studies of marketing, and land classification and prices.

[Investigations in agricultural economics by the North Carolina Station, 1935] (*North Carolina Sta. Rpt. 1935, pp. 22, 77, 78*).—In addition to results previously noted, brief findings are given by R. E. L. Greene as to the returns on investment in 1928, 1929, 1932, and 1934 for from 34 to 48 peach orchards studied, and findings by G. W. Forster as to changes of tax rates per acre, percentage of net cash income absorbed by taxes, etc., in a study of changes in taxes levied on North Carolina farm real estate from 1913 to 1935.

[Investigations in agricultural economics by the Texas Station, 1936] (*Texas Sta. Rpt. 1936, pp. 120–122, 123–126*).—Included in addition to findings previously noted are (1) tables by C. A. Bonnen, B. H. Thibodeaux (U. S. D. A., B. A. E.), and A. C. Magee showing by years 1931–35, inclusive, data pertaining to the organization and operation of from 127 to 141 farms in the high plains cotton area of Texas and the changes in size of equipment used on the farms studied from March 1, 1931, to March 1, 1936, and the acreage of crop land on farms using each size of equipment in 1935; (2) some brief general findings by W. E. Paulson in a study of quality as a factor in the marketing of vegetables in the Lower Rio Grande Valley, and by Paulson, G. S. Fraps, and R. T. Stewart in a study of central and local market prices of wheat in relation to quality; and (3) some findings by L. P. Gabbard and Paulson in a study made in cooperation with the Farm Credit Administration of the operating costs and financial conditions of 152 cooperative cotton gins for the season 1935–36.

Agricultural resources of Kansas, R. I. THROCKMORTON, J. A. HODGES, W. H. PINE, and W. E. GRIMES (*Kans. State Col. Bul., 21 (1937), No. 10, pp. 227, fig. 1*).—This bulletin, prepared by the Kansas Experiment Station and State Planning Board, presents information by counties regarding the area, rainfall, growing season, topography, soils, land use, livestock production, business organization of agriculture, tenure of operators, land values, farm power and improvements, population, and other features.

An economic study of land utilization in Monroe County, New York, W. T. WILSON and J. N. EFFERSON (*[New York] Cornell Sta. Bul. 683 (1937), pp. 47, figs. 16, map 1*).—This bulletin is one of the series previously noted (E. S. R., 78, p. 552) and follows the same general plan in describing and discussing the area, its agricultural history, soils, land classes and their farm businesses, real estate values, development of resources, etc.

An economic study of land utilization in Cortland County, New York, E. H. MATZEN (*[New York] Cornell Sta. Bul. 685 (1938), pp. 56, figs. 28, map 1*).—The analyses and discussions in this bulletin follow the same general lines as those in the bulletin noted above.

The agricultural depression in Finland during the years 1928–35, K. T. JUTILA (*Finland Min. Agr. Pub. 18 (1937), pp. 73*).—"This publication deals with the agricultural depression in Finland during the years 1928–35, the measures adopted for overcoming it, and the results achieved. It attempts to explain to foreign readers the structure of Finnish agriculture and the antidepression measures employed in Finland during recent years."

Agricultural land ratings and the farmers' levels of living, H. A. GIBBARD (*Michigan Sta. Quart. Bul., 20 (1938), No. 3, pp. 144–150, figs. 3*).—Twenty-nine Michigan counties in which more than half the total population was classified as rural-farm in the 1930 U. S. Census were selected for study. The relative suitability of the land for agricultural purposes in these counties as determined

by Veatch (E. S. R., 69, p. 778) was correlated with the standard of living index, retail sales per capita, average value of farm dwelling, independence of public relief, and percentage of children, aged 14 to 17 yr., at school. The average rank correlations between these elements and the land ratings were, respectively, 0.61, 0.62, 0.75, 0.74, and —0.03.

Subsistence homesteads (*Umsiedlung. Colonisation intérieure. Frankfurt-am-Main, Germany: Internatl. Housing Assoc., [1935] pp. 113, [figs. 28]*).—"This publication contains reports from various countries which have undertaken or are about to undertake in one form or another the settlement of certain classes of the population on the land." It is based on a questionnaire prepared by the International Housing Association. The reports are in English, German, and French.

Farm tenancy (*Duke Univ., School Law, Law and Contemp. Prob., 4 (1937), No. 4, pp. 424–575, fig. 1*).—The papers comprising this symposium consider some of the lines of governmental action being tried or that have been proposed for dealing with the problem of farm tenancy in the United States. Special emphasis is placed on the legal and administrative aspects. Papers as follows are included: Farm Tenancy Distribution and Trends in the United States, by H. A. Turner (pp. 424–433); The Bankhead-Jones Farm Tenant Act, by J. G. Maddox (pp. 434–455); Settlement and Unsettlement in the Resettlement Administration Program, by C. A. Wiley (pp. 456–472); The Development of the Rural Rehabilitation Loan Program, by M. Oppenheimer (pp. 473–488); Governmental Farm Credit and Tenancy, by W. G. Murray (pp. 489–507); Regulations of Farm Landlord-Tenant Relationships, by A. H. Cotton (pp. 508–538); A Note on the Legal Status of Share-Tenants and Share-Croppers in the South, by A. B. Book (pp. 539–545); Taxation in Aid of Farm Security, by R. J. Hinckley and J. J. Haggerty (pp. 546–558); and The Status of Agricultural Labor, by W. T. Ham (pp. 559–572).

An appraisal of farm land assessments, R. R. Renne and H. H. Lord (*Jour. Land and Pub. Util. Econ., 13 (1937), No. 4, pp. 360–371, figs. 3*).—This paper presents some of the findings previously noted (E. S. R., 78, p. 555). The history and background of the Montana assessment system are described, the inequalities in assessments discussed, and suggestions made for their correction by the establishment of a system of assessment based on the productivity value of different grades of land.

Development of assessment of property and collection of taxes in rural New York, F. F. Hedlund (*[New York] Cornell Sta. Bul. 681 (1937), pp. 51, fig. 1*).—The evolution of the system of the assessment and collection of taxes for State, county, town, school, and village purposes is traced from the colonial period, and the present situation is described.

Economy in county government, E. C. Weitzell (*Maryland Sta. Bul. 412 (1937), pp. 95–149, figs. 6*).—The historical development of Maryland, the development of local government, the physical characteristics of the counties, the relationship between local and State governments, the composition and distribution of population, and the revenues and obligations of the counties are described. An appraisal is made of the present county government and the possibilities of improving conditions existing in county administration.

"It is proposed to divide the State into 7 districts instead of the present 23 counties for local government. Larger districts seem to be needed in order to eliminate duplication and overlapping of certain services. In some instances the geographical characteristics of the State seem to favor consolidation of the counties into larger units, because of the natural boundaries and other regional conditions. In addition to added efficiency and economy that would be possible

by consolidation, assessments could be made more equal, government could be more comparable over the entire State, and greater equality of services would be received by all citizens. The major changes suggested for governmental reorganization, aside from the elimination of counties, are as follows: A reduction in the number of elected commissioners, limiting the duties of commissioners to policy determination, appointing a limited executive to carry out the details of board of commissioners' policies, and appointing a director of each of the 6 county organization departments.

"Consolidating the counties of Maryland into 7 districts would reduce the annual cost of county government by an amount estimated at $577,000 under the 1935–36 cost. General administration, recording services, and law and order expenses are the ones most likely to be reduced under the redistricting plan suggested. Those costs most affected by the redistricting would be reduced an average of 28 percent, while the total tax levies would be reduced 5 percent, or 65 ct. per capita. In addition to this economy, consolidation should increase the efficiency of service rendered for the money expended."

Relation of spot cotton prices to prices of futures contracts and protection afforded by trading in futures, L. D. Howell and L. J. Watson (*U. S. Dept. Agr., Tech. Bul. 602 (1938), pp. 100, figs. 17*).—This bulletin analyzes and discusses the relation of prices of spot cotton to prices of futures contracts; the protection afforded by futures as hedges against the risks from changes in prices of spot cotton and in basis; the gains and losses from transferring hedges; the effects of differences in (1) the place of delivery and terms and conditions of sale, (2) date of delivery and between the immediate and the prospective demand-and-supply situation, and (3) quality and classification on spot-futures price relationships and the protection afforded by futures as hedges; futures trading and fluctuations in spot-cotton prices; and the effects of futures trading on prices to producers.

"The effects of futures trading on the level of cotton prices are difficult to determine directly. Apparently any influence that futures trading in cotton may have on the level of prices to growers over a period of time results largely from its influence on costs in connection with merchandising cotton. Futures trading makes possible a reduction in the cost of merchandising cotton by supplying a means for obtaining protection from changes in prices of spot cotton, and for making savings in interest charges and in capital requirements. The benefits of protection from risks and the savings in capital costs are offset to some extent by direct charges for futures trading, the bulk of which are represented by commissions. Any net savings as the result of futures trading makes possible a reduction in the margins of costs necessary for merchandising cotton, and some students of futures trading believe that competition forces cotton merchants to pass on a substantial proportion of these savings to growers in the form of higher prices and to consumers in the form of lower prices. Available data, however, are not adequate for determining to what extent any such savings raise the prices to growers or reduce the prices to consumers."

The physical distribution of fresh fruits and vegetables, E. A. Duddy and D. A. Revzan (*Jour. Business Univ. Chicago, Studies Business Admin., 7 (1937), No. 2, pp. IX+[114], figs. 9*).—The economic and social basis and growth of the commercial fruit and vegetable industry and the market distribution of and the Chicago wholesale market for fruits and vegetables are described and discussed.

Supplement No. 2 to digest of decisions of the Secretary of Agriculture under the Perishable Agricultural Commodities Act, W. L. Evans (*U. S. Dept. Agr., Bur. Agr. Econ., 1938, pp. [378]*).—This covers the decisions to

February 1, 1938, and supersedes the supplement of October 1, 1937 (E. S. R., 78, p. 557).

The legal aspects of milk control, J. A. Tobey (*Chicago: Internatl. Assoc. Milk Dealers, 1936, pp. VII+102*).—"This manual is . . . an attempt to restate the constitutional, administrative, public, and private law in this country as it applies to the production, handling, processing, distribution, and sale of milk and dairy products." In its preparation more than 300 American court decisions relating directly to milk control were consulted. The introductory chapter discusses the reasons for the public control of milk. Other chapters deal with the sanitary regulation of milk by the State; municipal control of milk; licenses and permits; standards for milk and dairy products; inspection, sanitation, and seizure of milk; tuberculin testing and the health of dairy cattle; pasteurization; containers for milk; and liability in connection with dairy products. A table of cases by States, the Supreme Court of the United States, and Federal courts is included.

Federal and State control of milk prices, J. A. Tobey (*Chicago: Internatl. Assoc. Milk Dealers, 1937, pp. IV+42*).—This book, which supplements the manual noted above, reviews "the constitutional status of laws fixing prices and regulating the production and distribution of milk, as shown by the numerous court decisions that had been reported in the Federal and State courts at the beginning of 1937."

Elasticity of supply of milk from Vermont plants.—II, Factors affecting deliveries in Cabot and Marshfield, Vt., 1920–1935, S. M. Johnson (*Vermont Sta. Bul. 429 (1937), pp. 40, figs. 10*).—This is the second bulletin in the series previously noted (E. S. R., 58, p. 784). The present study is an analysis of the relation of supply to preceding price changes in a Vermont area of the Boston milkshed. The changes in the Boston market and Vermont dairying during the period are discussed. An analysis is made of the production response to changes in the milk-feed ratio in the Cabot-Marshfield area from 1920 to 1928, 1928 to 1935, and from 1920 to 1935. In the analysis of estimated deliveries, four independent factors were used—the 3-mo. accumulated average of the milk-feed price advanced 1 mo., the 12-mo. accumulated average advanced 10 mo., the 6-mo. accumulated average advanced 4 mo., and the 12-mo. accumulated average advanced 22 mo.

The total fluid milk and sweet cream receipts in the Boston market increased 35 percent from 1921 to 1936. Vermont dairy farmers shipped 81 percent more milk and 30 percent more cream to the Boston metropolitan area in 1936 than in 1921. This was accomplished through changes in the seasonality of production, increased fat production per cow, a higher level of cow population than in other areas of the milkshed, and an increasing proportion of the total milk produced being sold as fluid milk and sweet cream.

"The average ratio in the 3 mo. immediately preceding the production month was of most importance in the determination, the next 6 mo. of minor consequence, the next year of almost as great an importance as the first period, and the next year of less significance. Assuming linear relationships, total determination of production from variation in the milk-feed price ratios, grouped into these four independent factors, was about 38 percent. Multiple curvilinear correlation yielded a total determination, by the 3-mo. cumulative average of the price ratios advanced 1 mo. and the 12-mo. cumulative average advanced 10 mo., of abont 41 percent. The net curvilinear regressions showed that, within a period of 2 yr. at least, exceptionally high or exceptionally low milk-feed price ratios did not result in much greater changes in production than did only moderately high or moderately low ratios. A single weighted

index of the ratios, with weights based on a multiple correlation including, in 3-mo. averages, each month of the preceding 2 yr., yielded a determination of 39 percent. Farmers responded somewhat differently when the ratios were declining than they did when the ratios were rising. When the same time interval was allowed for the response to take place, the decrease in production in response to a given downward change in the ratio was not so great as the increase in production in response to a comparable upward change in the ratio. Milk prices appeared to be relatively more important in their effect on production than were feed prices. However, the milk-feed price ratio was more closely associated with deliveries than was either of its components."

Milk marketing in Lexington, J. B. Roberts and H. B. Price (*Kentucky Sta. Bul. 377 (1937), pp. 263–301, figs. 13*).—The development and nature of the Lexington milk market, the sources of market milk, the price mechanism, the consumption, variations in consumption by seasons and days of the week, surpluses and shortages, market competition, use of milk by pasteurizing plants, dealers' price spreads, etc., are described and discussed.

About one-third of all milk used in Lexington and about one-half of that sold in bottles is handled by producer-distributors. The other two-thirds is handled by plant-distributors buying all their milk from farmers and producer-pasteurizers who produce milk, operate pasteurizing plants, and purchase supplementary supplies. Under the present marketing system farmers bargain individually, and those selling to pasteurizing plants usually receive a flat price per hundredweight. The consumption is much less variable than the supply, resulting in surpluses and shortages. "A distinctive feature of competition in the sale of milk is the shifting of consumers between producer-distributors and pasteurizing plants." The 1932–36 average per capita consumption of milk, cream, and buttermilk was 0.56 pt. per day. Buttermilk constituted 21 percent of the daily per capita consumption. Dealers who pasteurize handle nearly 80 percent of the cream and buttermilk sales and carry a large proportion of the market surplus.

Financial records for farmers' creameries, F. Robotka and J. M. Cowden (*Iowa Sta. Bul. 369 (1938), pp. 345–375*).—"The general plan of the system of financial records described herein is that they shall supplement any adequate system of receiving, processing, and patrons' settlement records. The system proper consists of a cash receipts and sales journal, a cash disbursements and expense journal, and a general ledger." Forms are included and their uses described in detail and illustrated for cash receipts and sales journal, local sales and cash record, cash disbursements and expense journal, general ledger, record of shipments, operating statement, and supply inventory. The annual report is described and illustrated by reproductions of the financial statement, operating statement, and statistics of operation of an Iowa creamery. The allocation of expenses to settlement periods is discussed.

[Feeding and marketing costs of lambs] (*New Mexico Sta. Rpt. 1937, p. 13*).—Tables show by items the marketing costs per head and per hundredweight of lambs sold in the Kansas City, East St. Louis, and St. Joseph, Mo., markets; and the average costs and returns per head and the returns obtained for feed fed during the 1936–37 feeding year.

Dairy herd replacements in southern New Hampshire, H. C. Grinnell (*New Hampshire Sta. Bul. 302 (1938), pp. 27, figs. 2*).—This study was based on records for the year ended April 30, 1933, obtained by visits to 200 farms in the 5 southern counties of the State. The size of the farms, sources of income, land use, pastures, and pasture supplements are described. The additions to

milking herds, cow sales, adequacy of heifers for maintenance of herds, replacement practices, cow purchases, disease and replacement practices, and the application of the findings are discussed.

The economics of cooperative marketing, H. H. BAKKEN and M. A. SCHAARS (*New York and London: McGraw-Hill Book Co., 1937, pp. VIII+583, figs. 10*).—The purpose of this book, designed primarily as a college text, is "to present a comprehensive statement of the basic philosophy, the decisive principles, and the practical methodology of cooperation." Part 1 deals with the evolution of cooperative buying and selling. Part 2, the economic philosophy of cooperative marketing in the United States, has sections on basic economic concepts of the cooperative movement, principles of cooperative sales and purchasing associations, formation and types of cooperative associations, and membership relations. Part 3 deals with the legal basis of agricultural cooperative associations and membership contracts. Part 4, functional relationships of cooperative organizations, includes sections on management and financing of cooperative associations, pooling agricultural products, sales policies, and industry plans for the control of production and distribution of agricultural products. The limitations, possibilities, and future cooperation are discussed in part 5. The sections are followed by questions. Appendixes include the Capper-Volstead Act, approved February 18, 1922, and the membership agreement and contract of a potato grower's cooperative association.

Government measures affecting agricultural prices (*Internatl. Inst. Agr. [Roma], Govt. Measures Affecting Agr. Prices, 3 (1937), Nos. 11, pp. [2]+69–120; 12, pp. [2]+121–176*).—These numbers complete the series previously noted (E. S. R., 78, p. 121). No. 11 includes information on regulations of cereal consumption and prices in Germany, import duties and plenary powers in customs matters and measures relating to the national wheat board in France, maximum fixed prices in Italy, guaranteed butter and cheese prices in New Zealand, and the Livestock Industry Act in the United Kingdom. No. 12 includes information on the regulation of grain marketing in Argentina, new trade agreements concluded by the United States, new customs tariff in France, new primary products marketing legislation in New Zealand, quotas on bacon imports into the United Kingdom, and an extract of the Union of Soviet Socialist Republics customs tariff concerning cereals, meat, and dairy products. Beginning January 1, 1938, the information presented in this quarterly will be incorporated in the *Monthly Bulletin of Agricultural Economics and Sociology* of the International Institute of Agriculture.

Regional differences in farm price of horses and mules, Tennessee and United States, C. E. ALLRED and P. T. SANT (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog. 67 (1938), pp. [1]+II+18, figs. 8*).—Tables, charts, and maps are included and discussed showing the variations in the prices of horses and mules by crop reporting districts in Tennessee and between States and divisions of the United States. The factors affecting the price variations are discussed.

Regional differences in the farm price of milk cows and dairy products, Tennessee and United States, C. E. ALLRED and P. E. SANT (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog. 68 (1938), pp. [1]+III+41, figs. 19*).—The differences in prices of milk cows and dairy products in the six crop reporting districts in Tennessee and between the States of the United States are presented in tables, charts, and maps and discussed. The factors affecting the price variations are also discussed.

The first world agricultural census: Estonia (*Internatl. Inst. Agr. [Roma], First World Agr. Census Bul. 2 (1932), pp. 63*).—This is an English edition of the bulletin previously noted (E. S. R., 71, p. 270).

RURAL SOCIOLOGY

[**Investigations in rural sociology**], C. H. HAMILTON (*North Carolina Sta. Rpt. 1935, pp. 74–76, 77*).—Brief reports are presented on recent changes in the social economic status of farm families, human and social factors in soil erosion, and current changes in the rural relief population.

Family incomes and land utilization in Knox County, W. D. NICHOLLS, J. H. BONDURANT, and Z. L. GALLOWAY (*Kentucky Sta. Bul. 375 (1937), pp. 155–219, figs. 12*).—"This is one of a series of economic and social studies begun in 1929 which were undertaken to throw light on the problems of land utilization and conditions of living in the eastern Kentucky mountain region which have become increasingly acute during recent years. The principal objectives were to classify and show the present use and condition of land, particularly as to its slope, degree of erosion, productivity, and present and prospective ability to afford a living for its occupants; to ascertain whether and to what extent reforestation should be encouraged; to obtain data on family incomes, costs of and returns from crops associated with the various land classes and ranges of slope; to obtain information on housing and other factors of the living standards of the people and on the composition and nativity of families and the extent to which emigration or immigration affect the problem." Data were gathered as to these points on 176 representative farms in the Stinking Creek watershed, 60 being in the rough territory of the upper reaches of the creek, 55 in the lower territory where land resources are better, and 61 having for the most part lands and other resources of an intermediate order. Data limited largely to land utilization and drainage problems were also gathered from 165 farms in the valley of the Big Richland Creek and 42 farms bordering the Cumberland River, these areas having more well-lying land than the average for the Stinking Creek area and studied to ascertain the possibilities of such lands affording resettlement opportunities for families living on the rough lands of eastern Kentucky counties. The relation of cropland per farm and relief payments in the areas studied is discussed, and two systems of farming for the areas are suggested. Proposals for the betterment of the conditions of the occupants are also discussed.

Three farmstead communities in central Nebraska, O. K. KRUEGER (*Social Serv. Rev., 11 (1937), No. 4, pp. 575–622, pl. 1*).—This is a report on the rural rehabilitation activities of the Federal Emergency Relief Administration in the three Nebraska communities.

The rural community and its schools, C. D. LEWIS (*New York: Amer. Book Co., 1937, pp. XVI+412, figs. 5*).—This book provides information concerning the current situation in rural America. It deals with the problems that must be solved, and gives suggestions for their solution which should be helpful to all who are preparing to work in villages and rural schools.

High school communities in Michigan, J. F. THADEN and E. MUMFORD (*Michigan Sta. Spec. Bul. 289 (1938), pp. 36, figs. 4, map 1*).—This study involved mapping the 6,671 school districts and 533 high school communities (attendance areas) in the State.

Approximately four-fifths of the farm boys and girls of Michigan receive their elementary education in some 6,000 one-room country schools in their local neighborhoods. Those who satisfactorily complete their eighth grade education and pursue secondary education do so as nonresident, tuition pupils at schools located in some 533 villages and cities.

In only a few instances does the legal area of the high school district approximate the size of the area actually served. The majority of the high school districts are no larger or only slightly larger than the average primary school

district. High school communities range in size from less than 10 to 500 sq. miles and over, the area being closely related to population density. The attendance area of nearly one-half of the 12-grade schools covers part of 2 or more counties, 51 cover parts of 3 counties, and some cover parts of 4 counties. Twelve high school communities extend into Ohio and Indiana.

The average high school is attended by pupils from 13 school districts, but there are 69 high schools which are attended by pupils who come from 25 to 63 different school districts. Nonresident pupils outnumbered the resident pupils in 43 percent of the high schools during the 11-yr. period 1920–31, and in the average high school with an enrollment under 200 pupils 45 percent of them are nonresident. At all ages the percentage of children attending school is higher for urban children than for farm children.

It is recommended that the residents who live within each of the 533 high school communities evaluate the advantages and disadvantages of a community school district which would provide educational and sociological opportunities to farm boys and girls somewhat on a par with those now offered the village and city child.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Digest of annual reports of State boards for vocational education to the Office of Education, Division of Vocational Education: Fiscal year ended June 30, 1937 (*U. S. Dept. Int., Off. Ed., Vocat. Div., 1937, pp. [III]+II+[III], pls. 5*).—"The digest comprises (1) an introductory statement in which the Federal vocational education acts are listed and their purposes indicated, and the progress of State boards for vocational education in formulating plans for the 5-yr. period beginning July 1, 1937, and the character and composition of the Federal Advisory Board and of the Technical Advisory Committee on Trade and Industrial Education are discussed; (2) a general introductory survey of developments in the fields of vocational education and vocational rehabilitation of disabled persons during 1936; (3) a summary of descriptive reports by the States covering administration and developments under State plans in the several fields of vocational education—agricultural, trade and industrial, home economics, and commercial—and in the field of vocational rehabilitation of the disabled; (4) an appendix containing a statement concerning the recent revision of policies on vocational education issued by the Office of Education and a summary of opinions on the provisions of Federal vocational education and vocational rehabilitation acts; and (5) statistical and financial tables compiled from State reports showing by States expenditures of Federal, State, and local money, enrollments in vocational schools, and number of disabled persons vocationally rehabilitated."

Teaching conservation of wildlife through 4–H clubs, R. Lohmann (*U. S. Dept. Agr., Misc. Pub. 291 (1938), pp. 34, figs. 4*).—The present status of American wildlife, the need for its conservation ,and the opportunities for teaching such conservation through 4–H clubs are discussed. A list of conservation practices and activities for club members is included, and the place of wildlife conservation in 4–H programs before 1936 described. Two possible approaches—conservation as an activity like music or drama and conservation as a project like dairy-calf, clothing, or other projects—are discussed. The means and agencies of use in teaching conservation are described, and a typical 4–H club program for a year is outlined. An appendix includes some forestry games, a list of bibliographic publications including wildlife conservation citations, and selected lists of State extension service, agricultural experiment station, departments of agriculture, and general publications on wildlife.

Home economics (*[New York] Cornell Sta. Rpt. 1937, pp. 128–134*).—A brief history is given of the development in the College of Home Economics, Cornell University, of research in economics of the household and household management, foods and nutrition, textiles and clothing, institution management, and family life.

FOODS—HUMAN NUTRITION

[**Foods and nutrition studies by the Maine Station**] (*Maine Sta. Bul. 387 (1937), pp. 195–201, 226, 227*).—This progress report summarizes further studies by M. M. Clayton on the food habits and nutritional status of children in selected communities in Maine (E. S. R., 77, p. 128); by W. F. Dove on the relation of man and animals to the environment (E. S. R., 73, p. 273); and by M. D. Sweetman and P. S. Greene on the cooking qualities of potatoes (E. S. R., 76, p. 559).

[**Foods and nutrition research by the New Mexico Station**] (*New Mexico Sta. Rpt. 1937, pp. 57, 58, 59*).—This progress report summarizes studies on the effect of different methods of cooking on the vitamin B and G content of New Mexico pinto beans (E. S. R., 74, p. 423), and determination of the iron content of the pinto bean and the effect of pinto beans on the regeneration of hemoglobin in nutritionally anemic rats.

[**Foods and nutrition research of the Texas Station**] (*Texas Sta. Rpt. 1936, pp. 18, 19, 141–146, 147, 148, 194, 195*).—Progress reports (E. S. R., 76, p. 561) are given by J. Whitacre on an extension of the analysis of the records of growth in weight and height of Texas school children and on a study of the effect of tea upon the energy metabolism of children; by Whitacre, L. R. Hawthorn, and S. H. Yarnell on the factors affecting the storage of cucumbers; by S. Cover and H. Schmidt on the processing of canned meat; by Cover and F. Hale on the various methods of storing cured bacon in different oils; and by H. M. Reed on a continuation of fig products investigations.

[**Nutrition studies by the Wyoming Station**] (*Wyoming Sta. Rpt. 1937, pp. 25–27*).—This progress report summarizes studies on the cooking quality of potatoes, deep fat frying of doughnuts at high altitudes, and the making of white and whole wheat bread with dry yeast (E. S. R., 77, p. 128).

Meat food products (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt., 1937, p. 26*).—This progress report summarizes studies on the production of linoleic acid "deficiency" in rats and the relative value of lard and oleo oil as a source of the fatty acids essential for the prevention and cure of this condition, and on the comparative nutritive value of sweet and rancid samples of lard and oleo oil.

The milk problem: A critical study of its nutritional, hygienic, economic, and social aspects, H. C. Bendixen, G. J. Blink, J. C. Drummond, A. M. Leroy, and G. S. Wilson (*League Nations Health Organ. Bul., 6 (1937), No. 3, pp. 371–504*).—The four aspects of the milk problem in Europe are discussed separately. The main nutritive qualities of milk for human beings are considered to be the fat content, which greatly influences the energy value; the nitrogen content, which is important in human physiology; the content in mineral salts, which is particularly important for the proper development of the growing child; and the vitamin content, which is important in growth and in the prevention of disease.

Potato mealiness and changes in softness on cooking, M. A. Barmore (*Food Res., 2 (1937), No. 4, pp. 377–383, figs. 4*).—In this report of a study which has been noted as in progress at the Colorado Experiment Station (E. S. R., 78, p. 719), the author gives the results of penetrometer measurements made on samples of five varieties of potatoes, microscopic examination of the cell size

of eight samples of cooked potatoes, and determination of the protopectin content in eight samples having approximately equal starch content but differing degrees of mealiness to determine what factors in addition to starch contribute to mealiness in the cooked potato. The less mealy tubers were not found to contain a higher pectin content, and no significant relationship was demonstrated between the cell size and the degree of mealiness. A high correlation was noted between the penetration and the starch content, with the degree of penetration being lessened as the starch content increased. No correlation was found between texture and penetration.

The making of potato chips in relation to some chemical properties of potatoes, M. C. and C. F. Rogers and A. M. Child (*Amer. Potato Jour., 14 (1937), No. 9, pp. 269–290*).—In this study conducted at the Minnesota Experiment Station, the authors investigated the proper frying technic for the production of good chips from three varieties of Minnesota-grown potatoes kept in storage. The amounts of ash, dry matter, crude protein, and reducing sugars were determined on the freshly cut potatoes, and the chips were compared for color, texture, and flavor. The fat: slice ratio, which represents the ratio of the mass of fat to the mass of slice introduced at one time, was estimated.

The following conclusions are noted: The frying temperature is the most important factor in making good chips, and it depends upon the amount of reducing sugars present in the slices after soaking in water and upon the variety and the condition of the potato. The sugar content is increased during storage, and potatoes having a high sugar content require lower immersion and frying temperatures than do those with less sugar. The fat: slice ratio, the initial temperature, and the rate of heat intake of the frying system all contribute to the attainment and maintenance of the proper frying temperature.

The nutritional value of spinach (*Jour. Amer. Med. Assoc., 109 (1937), No. 23, pp. 1907–1909*).—The existing information regarding the composition and nutritional significance of spinach is reviewed in this report, authorized by the Council on Foods of the American Medical Association. It is concluded that spinach is a rich source of vitamin A and contributes vitamin C, iron, and roughage to the diet. The iron content of spinach is not wholly available, nor is the calcium, and furthermore, the presence of soluble oxalates in the spinach may interfere with the absorption of the calcium of other foods. Spinach is not recommended as a source of calcium and iron for infants, but it may well be retained along with other leafy vegetables in the diet of children and adults.

The nutritive value of apples, E. N. Todhunter (*Washington Sta. Pop. Bul. 152 (1937), pp. 32, figs. 5*).—The author discusses the place of the apple in the normal diet, the vitamin content, and the therapeutic uses. Tables are presented showing the vitamin C content of approximately 44 varieties, with some values for the vitamins A and B complex, as reported by a number of investigators in the United States and England; the ascorbic acid content of 11 varieties; the uronic acid values for 9 varieties; the approximate number of Washington-grown apples required daily to protect a man from scurvy; and the average composition of apples (*Malus sylvestris*), apple powder, and canned applesauce. The bibliography lists 122 references, which include 49 on the vitamin content of apples and 45 on the uses of apples in intestinal disorders.

Nuts and ways to use them, E. F. Whiteman (*U. S. Dept. Agr., Misc. Pub. 302 (1938), pp. 9*).—The food value and directions for the selection and care, blanching, salting, and roasting of nuts are given in this publication, together with about 25 recipes.

How to make candy, W. W. Chenoweth (*New York: Macmillan Co., 1936, pp. XII+212, [pls. 15]*).—In addition to recipes based on tested formulas, this

book contains discussions of the theories and science which underlie the practices of candy making. The appendix contains a table showing the temperature and water tests for candies and a glossary of the terms used in the discussion.

[**Flavors in foods symposium**] (*Food Res., 2 (1937), No. 3, pp. 183–286, figs. 6*).—This symposium consists of the following papers read before the 1937 meeting of the American Chemical Society at Chapel Hill, N. C.: Food Flavors—A Critical Review of Recent Literature, by E. C. Crocker and W. Platt (pp. 183–196); The Flavor of Meat and Meat Products, by P. E. Howe and N. G. Barbella (pp. 197–202); Use of Activated Carbon for Correction of Flavors, by J. W. Hassler (pp. 203–206); Obtaining a Panel for Judging Flavor in Foods, by F. B. King (pp. 207–219); Flavor of Alcoholic Beverages, by E. K. Nelson (pp. 221–226); Chemical Determination of Aroma in Butter and Butter Cultures, by M. E. Parker and G. W. Shadwick, Jr., (pp. 227–235); Some Fundamental Assumptions Pertaining to the Judgment of Food Flavors, by W. Platt (pp. 237–249); Modern Trends in Flavors, by B. H. Smith (pp. 251–253); Oxidation in Relation to Off-Flavors in Milk and Certain Milk Products, by L. M. Thurston (pp. 255–272) (E. S. R., 78, p. 390); and Measuring Food Flavors, by E. C. Crocker (pp. 273–286).

Objective tests for cooked food, E. G. HALLIDAY (*Food Res., 2 (1937), No. 4, pp. 287, 288*).—The author gives a few illustrations, with literature references, of objective tests now in use for measuring the properties of cooked foods, such as the dynamometer and penetrometer for determining the tenderness and juiciness of cooked meat; the microphotometer for determining the cellular structure and the penetrometer for determining the tenderness of cooked vegetables; the color measurements in terms of hue, value, and chrome for measuring the green color in cooked vegetables; the shortometer for determining the tenderness of wafers and pastries; the instrument devised to measure the tensile strength of cakes; and the use of photographs for studying the relative volume and grain of cakes.

Comparative experiments with canned, home cooked, and raw food diets, E. F. KOHMAN, W. H. EDDY, M. E. WHITE, and N. H. SANBORN (*Jour. Nutr., 14 (1937), No. 1, pp. 9–19*).—Three groups of rats were maintained on rations composed of canned, home cooked, and raw foods in about 50 combinations, using practically all of the common vegetables, fruits, meat, and fish products and excluding milk. The influence of heredity was eliminated by testing both single-generation animals and representatives of five generations on each ration.

The rats receiving the canned food diet reproduced an average of 8 rats per litter as compared to 7.94 and 7.1 for the home cooked and raw food groups, respectively, and with their young showing the highest average weight at birth, time of weaning, and at 60 and 90 days of age. The average percentage of bone ash was also highest for the rats on the canned food diet. It is suggested that the process of cooking has "beneficial effects on physical structure and texture of foods and inactivates plant enzymes which are detrimental in many instances in handling foods. Insofar as canned foods represent the raw product in their prime, they represent a unique means of distributing perishable foods with their inherent nutrient qualities efficiently conserved."

The theory is advanced that the thorough cooking undergone in the canning process tends to lower the absorptive effect of the vegetable fiber for calcium and thus increase calcium availability.

Report on popular nutrition in Chile, C. DRAGONI and E. BURNET (*League Nations Health Organ. Bul., 6 (1937), No. 3, pp. 299–370, figs. 5*).—This report, which was prepared at the request of the Health Commission of the League of Nations to serve as an example of the type of inquiry that would be possible and

desirable in other countries, is divided into discussions of the geographical and economic bases of nutrition, the conditions of agricultural production, the present state of nutrition, the previous inquiries into the problem, and the bases and conditions for improved nutrition in Chile.

Nutrition research in the British Colonial Empire (*Imp. Bur. Anim. Nutr. [Aberdeen], Tech. Commun. 8 (1937), pp. 46*).—In this communication are reviewed the principal results of a survey covering the years 1926 to 1936 on the existing dietary conditions in relation to the health of the people in Africa; Palestine and the Mediterranean region; Ceylon, Malaya, and East Indian territories; West Indies and neighboring territories; and the islands of the western Pacific and the South Atlantic. An appendix contains a discussion of the nutritional studies conducted in the Union of South Africa. A bibliography lists 173 references.

Historical studies of English diet and nutrition, I–III, J. C. Drummond (*Jour. Roy. Soc. Arts, 86 (1938), Nos. 4443, pp. 191–206; 4444, pp. 214–225; 4445, pp. 246–258*).—The characteristics of the English diet since the Middle Ages are discussed in these review papers, which are included in the series of Cantor lectures.

Health indices in an experimental study of a rural district of Hungary, K. Stouman (*League of Nations Health Organ. Bul., 6 (1937), No. 5, pp. 766–821, fig. 1*).—This report on the health conditions and their trend in the District of Mezőkövesd, Hungary, as determined by a survey conducted in 1937, is divided into discussions on the indexes of environment, vitality and health, and public health activity.

Physique and health, C. Wroczynski (*League of Nations Health Organ. Bul., 6 (1937), No. 4, pp. 551–682, figs. 6*).—This report is based on information gained from inquiries carried out in seven European countries and represents the opinions of a great many experts in the fields of physiology, biology, educational science, medicine, and anthropometry. The report is divided into discussions on the harmful aspects of our civilization; the physical conditions of the present generation; physique and medical science; physique, heredity, and constitution; methods of assessing physique; physical exercises; grouping of individuals according to age and constitution; physical training for women; and gymnastic systems and methods.

Assessing the nutrition of school-children, E. H. Wilkins (*Lancet [London], 1937, II, No. 22, pp. 1265–1267*).—In this review paper the author points out that the measure of the nutrition of a child cannot be based on the height: weight ratio, the presence of visible pallor, or the degree of well-being and activity. From the practical point of view food is the most important factor in nutrition, and by correlating the physical and functional condition of children with the actual diets they consume, the state of nutrition may be assessed fairly accurately. The three methods of assessment suggested are a comparison of the diet with standard nutritional requirements, a test of the adequacy of the diet by the addition of supplementary foods to take care of suspected deficiencies, and the application of tests for deficiencies such as hemoglobin and the vitamins A, B_1, and C. The optimal and not the average should be used as the standard in nutrition.

Height-weight-surface formula for the estimation of surface area in Chinese subjects, P. H. Stevenson (*Chin. Jour. Physiol., 12 (1937), No. 3, pp. 327–330, fig. 1*).—The author notes that "the practice in basal metabolism determinations of measuring calories within a range of accuracy of 1 or 2 percent and then dividing by a factor whose known variability is at least two or three times as great is not one to be continued longer than the circumstances warrant."

For greater accuracy he offers a specifically derived surface area formula

$$A=0.0061\ H+0.0128\ W-0.1529\pm0.0254$$

where A represents the surface area in square meters, H the stature in centimeters, and W the weight in kilograms. The application of this formula to 30 cases selected at random gave an average deviation of 0.019 as compared to 0.035 for the DuBois occidental formula.

Nutrition and nutritional diseases, [I], II, L. G. PARSONS (*Lancet [London], 1938, I, Nos. 2, pp. 65–70; 3, pp. 123–128, figs. 3*).—These two Withering lectures of 1937 were delivered before the University of Birmingham.

In the first lecture the author deplores the absence of any definite standards of nutrition and malnutrition. The complexity of the problem of nutrition is demonstrated by a discussion of the nutrition and nutritional diseases of the red blood cell and particularly with the effects of a deficient supply of iron; calcium; bile pigments; copper and other metals such as cobalt, manganese, zinc, and vanadium; thyroxine; and vitamin C.

In the second lecture he reviews the role of vitamin C in latent scurvy, cataract, gastric ulcer, acute rheumatism, Addison's disease, dental caries, diphtheria, pneumonia, and hemorrhagic states. It is concluded that vitamin C is not the curative factor in any disease except scurvy, and there is no justification for the administration of large amounts of this vitamin as a therapeutic or prophylactic measure in every variety of infection. The requirement for vitamin C is high for the pregnant woman and the nursing mother to insure an adequate store of the vitamin for the newborn infant. The artificially fed infant requires a generous supply of vitamin C. Additional vitamin C is required in any condition that considerably increases the basal metabolism and may result in the depletion of the body stores of vitamin C, render it less potent, or in some way interfere with its absorption from the alimentary tract.

Nutritive value of lactalbumin versus casein, M. C. KIK (*Soc. Expt. Biol. and Med. Proc., 37 (1937), No. 1, pp. 129–131*).—In this preliminary report of experiments on growth, nitrogen storage, metabolism, and comparisons of weight gains of rats on diets containing 8 and 12 percent lactalbumin and casein, the data show that the lactalbumin was superior to the casein in nutritive value for maintenance and growth.

The relation of cystine and methionine to growth, M. WOMACK, K. S. KEMMERER, and W. C. ROSE (*Jour. Biol. Chem., 121 (1937), No. 2, pp. 403–410, figs. 2*).—The results of feeding experiments on rats maintained on rations containing known mixtures of highly purified amino acids in place of proteins are presented to show that methionine is indispensable as a component of the diet and that cystine is incapable of promoting growth in the absence of methionine, which is not in agreement with the observations of Jackson and Block (E. S. R., 69, p. 145). The findings demonstrate that cystine is not an essential component of the diet.

The nutritive significance of the amino acids, W. C. ROSE (*Physiol. Rev., 18 (1938), No. 1, pp. 109–136*).—In this review paper the author reports the results of experiments by different investigators to determine which amino acids are indispensable and which may be excluded from the diet without interfering with the normal physiological processes of the organism. It is concluded that of the 10 indispensable amino acids with respect to their growth effects *l*-tryptophan, *l*-histidine, *l*-phenylalanine, and *l*-methionine can be replaced by their antipodes for growth purposes, but only the natural forms of valine, leucine, isoleucine, lysine, and threonine are available for the use of the growing organism. The substitution of *l*-arginine for *d*-arginine has not been investigated, but it has been established that arginine, although it can be

synthesized by the animal organism, is indispensable because the rate of synthesis is inadequate to meet the demands of normal growth. The bibliography contains 127 references.

The comparative nutritive values of glucose, fructose, sucrose, and lactose when incorporated in a complete diet, H. H. Mitchell, T. S. Hamilton, and J. R. Beadles (*Jour. Nutr.*, *14* (*1937*), *No. 5, pp. 435–452*).—The results of paired feeding tests on rats receiving adequately balanced experimental rations containing from 60 to 70 percent of sucrose, fructose, and lactose in comparison to glucose are presented to show that the digestibility of the organic constituents of the diet was impaired slightly on the sucrose, to an intermediate degree on the fructose, and to the greatest extent on the lactose ration, but not on the glucose ration. The rate of gain in body weight and the deposition of protein, which were not affected on the glucose and sucrose rations, were slowed up to some extent on the fructose and to a marked degree on the lactose ration. The metabolic utilization of calcium was increased by the presence of sucrose, fructose, and lactose in the diet, and lactose also promoted the utilization of phosphorus.

Dietary calcium and pH of the lower intestine, E. C. Robertson (*Soc. Expt. Biol. and Med. Proc.*, *37* (*1937*), *No. 1, pp. 140–143*).—The results of a series of tests on groups of young rats maintained on diets deficient in calcium and/or potassium, or containing varying amounts of these minerals, are reported. The pH in the large intestine was about 6.0, and intestinal stasis occurred when calcium was withheld. The rats receiving an adequate diet had an intestinal pH of 7.0.

The occurrence of non-haemoglobin iron in whole blood, H. W. Josephs and P. Winocur (*Bul. Johns Hopkins Hosp.*, *61* (*1937*), *No. 2, pp. 75–89, figs. 4*).—The authors report that during the first 2 mo. of life, during infections, during iron therapy up to the end of the second year of life, and in a few isolated cases of scurvy, lead poisoning, myxedema, and cirrhosis of the liver the total iron content of the blood was found to exceed the hemoglobin iron by more than 6 mg per 100 cc. The hemoglobin concentration when determined by the Newcomer method was more than 20 percent higher in about 10 percent of the cases than when it was calculated from the oxygen capacity. The two possible interpretations of this apparent discrepancy between total and hemoglobin iron are that "(1) it represents a possibly more primitive form of hemoglobin having a higher content of iron than is present ordinarily, [and] (2) it represents an iron-containing organic compound which does not carry oxygen and may possibly represent an intermediate product in the formation and break-down of hemoglobin."

Absorption and excretion of iron, R. A. McCance and E. M. Widdowson (*Lancet* [*London*], *1937*, *II*, *No. 12, pp. 680–684*).—The authors present a new theory to the effect that the absorption of iron is conditioned mainly by the relative concentration of free ionized iron in the lumen of the intestine and in the cells and plasma, and that the iron is excreted in very small amounts both by the bowel and kidney due to the activity of the storage organs constantly maintaining the plasma iron at a low level. If the iron intake is low, practically no iron will be absorbed because the concentration of free iron in the small intestine will never rise much above that of the free iron in the cells, and further, since iron is a divalent or trivalent ion, it probably passes through the cells only with great difficulty in either direction, so that small differences of concentration may develop and even be maintained for a time without appreciable passage of ions.

The authors point out the possibility of a sex difference in the utilization of iron, and sum up the findings of a number of investigations to suggest that

women, since they appear to live at a lower plane of iron metabolism than men, may utilize the small amounts if iron which they do absorb rather differently from men. The theory is put forward "not with any suggestion of finality, but because it seems to offer a better explanation of the experimental and clinical findings, taken as a whole, than any other, and also because it indicates a number of points which clearly require investigation."

The absorption and excretion of iron before, during, and after a period of very high intake, E. M. Widdowson and R. A. McCance (*Biochem. Jour., 31 (1937), No. 11, pp. 2029–2034, fig. 1*).—Evidence is presented to support the view that the intestine has no power to regulate the amount of iron in the body by varying the amount excreted, and that since the intestine normally excretes little or no iron, the amount present in the body must be regulated by the amount absorbed. Four subjects, two men and two women, were given diets containing from 7 to 9 mg of iron per day, and when it had been established that they were in iron balance they were given about 1,000 mg of iron daily by mouth.

Positive balances were obtained in each subject, and after discontinuing the iron but allowing time for the excretion of the unabsorbed iron from the intestine, absorptions of from 1.5 to 5 g of iron were found. The subjects were again in iron equilibrium on low iron intakes immediately after absorbing these large amounts of iron. In one woman subject the hemoglobin concentration rose about 5 percent during the administration of the large doses of iron, but fell again to its original level in spite of the fact that the subject had stored away in her body 5 g of additional iron which was more than enough to double the hemoglobin of her blood. The hemoglobin concentration of the other woman subject, which was initially high for a woman, remained unchanged in spite of the large quantities of iron absorbed.

Studies on the retention of iron in childhood, J. H. Hutchison (*Arch. Disease Childhood, 12 (1937), No. 71, pp. 305–320, figs. 6*).—From observations made on the retention of iron over an 8–16 weeks' period in four nonanemic and two anemic children receiving iron supplements, the author concludes that the body is capable of retaining large amounts of iron and that the necessity for giving large doses of iron by mouth does not depend upon the poor absorption of iron by the intestine. The suggestion is made that the iron stored in the liver is not available for hemoglobin formation, and that only when massive doses are administered can the iron be pushed past the liver directly into the circulation for use in hemoglobin formation.

Vitamin studies on bananas.—I, The vitamin A, B_1, and C contents of ripe bananas, P. L. Harris and G. L. Poland (*Food Res., 2 (1937), No. 4, pp. 311–19, figs. 4*).—The U. S. Pharmacopoeia method of calculating vitamin A potency, the technic proposed by the American Drug Manufacturers Association for determining vitamin B_1, and the bio-assay technic of Sherman, La Mer, and Campbell with the substitution of 2 percent of cod-liver oil for an equal amount of the butterfat in the basal diet, and a modification of the titration method for determining vitamin C were used. The following values are reported for ripe banana pulp: 71–95 international units of vitamin A, 4–5 international units of vitamin B_1, and approximately 57 international units of vitamin C per ounce.

On the analysis of the provitamins A in blood serum, A. G. van Veen and J. C. Lanzing (*K. Akad. Wetensch. Amsterdam, Proc., 40 (1937), No. 9, pp. 779–784*).—By chromatographic analysis the carotinoid content of the blood of 16 Europeans, including a group of prisoners on a known diet, was determined qualitatively, together with the provitamin A in the food intake of the prisoners.

In contrast to the other Europeans, the blood serum values of the prisoners showed the presence of β-carotene only in small amounts and α-carotene mostly absent, with cryptoxanthene present in large quantities. It is suggested that the prisoners had to draw all of their vitamin A from the conversion of α- and β-carotene, since their diet was practically devoid of vitamin A, and that cryptoxanthene may not be a provitamin A for man as it is for the rat. The average real vitamin A level of all the subjects ranged from 5.9 to 13.2 international units and the β-carotene from 7γ to 21.8γ per 10 cc of blood serum.

Further studies on the effect of excessive vitamin A on the oestrous cycle of the rat, T. C. Sherwood, O. R. Depp, G. P. Birge, and H. B. Dotson (*Jour. Nutr., 14 (1937), No. 5, pp. 481–486*).—In continuation of a previous study (E. S. R., 76, p. 884) and following the same method of procedure, the authors report that the oral and subcutaneous administration of 1,500 international units of vitamin A in the form of carotene produced a change in the oestrous cycle of the rat, as shown by the presence of nucleated epithelial cells and leucocytes in the vaginal smears, with very few cornified cells.

Topical applications of vitamin A and of carotene, I, II, A. C. Helmer and C. H. Jansen (*Studies Inst. Divi Thomae, Athenaeum Ohio, 1 (1937), No. 1, pp. 1–9, figs. 15; 10–15, figs. 10*).—This paper is presented in two parts.

I. *Absorption of vitamin A from halibut-liver oil.*—Data are presented to show that the vitamin A contained in halibut-liver oil is readily absorbed through the skin by topical application. After 25 days on the vitamin A-deficient diet, the ten rats gained weight and did not develop xerophthalmia when 0.05 cc of halibut-liver oil containing aproximately 2,530 U. S. P. units of vitamin A was applied daily for 8 days to an area of skin on the back of the neck from which the fur had been clipped.

II. *Absorption of carotene.*—The results of similar tests with carotene concentrate in oil solution are presented to show that the provitamin A is also readily absorbed through the skin in sufficient amounts to promote growth and prevent xerophthalmia.

Signs of vitamin A deficiency in the eye correlated with urinary lithiasis, W. J. Ezickson and J. B. Feldman (*Jour. Amer. Med. Assoc., 109 (1937), No. 21, pp. 1706–1710, figs. 4*).—In a clinical study conducted on 75 patients, 25 of whom had renal urolithiasis, quantitative estimations of dark adaptation were made by means of the Feldman photometer. With three exceptions the test was negative for the 50 patients in the control group, but 24 of the patients with urolithiasis were found to have pathologic dark adaptation varying from mild to severe. These patients were given from 13,000 to 52,000 international units of vitamin A daily over a period of from 6 to 9 mo., and of 15 patients who returned for restudy only 1 showed any improvement.

It would appear that the vitamin A deficiency which occurs in association with urolithiasis is dependent on a lack of assimilation or utilization of vitamin A rather than on a dietary deficiency of the vitamin. The authors suggest the possibility that the lack of vitamin A assimilation or utilization and urolithiasis may have a common metabolic basis.

Difficulties in the use of bradycardia method of assaying vitamin B_1, E. C. Robertson and M. E. Doyle (*Soc. Expt. Biol. and Med. Proc., 37 (1937), No. 1, pp. 139, 140*).—The authors report that the bradycardia method, as described by Harris and Leong (E. S. R., 76, p. 425), for vitamin B_1 assay, gave inconsistent results when tested on about 180 rats.

Nitrogen, sulfur, sodium, potassium, and chloride metabolism in vitamin B_1 deficient rats, M. Sandberg, D. Perla, and O. M. Holly (*Soc. Expt. Biol. and Med. Proc., 37 (1937), No. 2, pp. 350–352*).—The authors present data to show that vitamin B_1-deficient rats had increased urinary nitrogen and sulfur

excretion and decreased fecal nitrogen excretion, with unchanged fecal sulfur excretion.

Vitamin B and G values of peas and lima beans under various conditions, M. S. Rose and E. H. F. Phipard (*Jour. Nutr., 14 (1937), No. 1, pp. 55–67, figs. 2*).—The vitamin B (B_1) and G content of peas and lima beans was determined by bio-assay following the Chase and Sherman method for the vitamin B tests and the Bourquin and Sherman method for the vitamin G studies.

Fresh raw peas of the 1934 crop contained approximately 3 Sherman and Chase units of vitamin B per gram and were about twice as rich in the vitamin as the fresh lima beans. The freezing process did not alter the vitamin B content of the peas, but cooking for 15 min. resulted in the loss of about 26 percent. Frozen peas of the 1933 crop were lower in vitamin B content than were those of the 1934 crop. The vitamin B content of mature peas and lima beans was equal to approximately half the content during the fresh state. Both vegetables in the fresh raw state contained approximately 1 Sherman and Bourquin unit of vitamin G per gram, with no loss resulting after cooking or freezing and very little after maturity. Sprouting tests revealed a loss of over half of the vitamin B content during the 14-day period, but the sprouts contained approximately as much vitamin G as the original seeds, and some vitamin G still remained in the seed remnant.

Vitamin G in lamb muscle and organs, M. Kellogg (*S. Dak. Acad. Sci. Proc., 16 (1936), pp. 24–27*).—This is a summary of a study previously noted in progress (E. S. R., 77, p. 570).

Appearance of cataract in rats on a vitamin B_2 low diet, M. Kellogg (*S. Dak. Acad. Sci. Proc., 17 (1937), pp. 21, 22*).—In connection with the study noted above at the South Dakota Experiment Station, the incidence of cataract was determined in rats maintained on synthetic diets deficient in vitamin B_2 (G) and supplemented by varying amounts of heart, liver, and meat.

The rats receiving 50-, 100- and 150-mg supplements of liver and 750-, 1,000-, and 1,500-mg supplements of meat did not develop cataract. Fifty percent of the rats on the 500-mg level of meat and 60 percent on the 500-mg, 70 percent on the 300-mg, and 71 percent of the animals on the 100-mg level of heart feedings developed cataract. The mean gains in weight were greatest for the rats receiving the 1,000-mg and 1,500-mg supplements of meat and the 300- and 500-mg supplements of heart. The liver supplement prevented cataract but resulted in very low weight gains, suggesting that "there are two heat-stable factors that are measured in the experiment—one the cataract-preventive and the other a growth-promoting factor."

Further studies on factor W, D. V. Frost and C. A. Elvehjem (*Jour. Biol. Chem., 121 (1937), No. 1, pp. 255–273, figs. 6*).—In continuation of a previous study (E. S. R., 78, p. 285) conducted at the Wisconsin Experiment Station, the authors present further evidence for the existence of a water-soluble vitamin known as factor W in liver preparations distinct from the vitamins B_1, B_4, B_6, the antipellagra factor, and flavine. The possibility of factor W being of a multiple nature was suggested by results of bio-assays of the fractions singly and in combination after precipitation by the Warburg method. Both the precipitate and filtrate gave some growth response, but optimum growth was obtained only when both fractions were fed.

Studies on the biological and chemical assays of vitamin C.—III, Influence of cooking upon amaranth, H. C. Hou (*Chin. Jour. Physiol., 12 (1937), No. 3, pp. 381–387, figs. 2*).—In continuation of studies noted previously (E. S. R., 76, p. 279) and with essentially the same methods for chemical estimation and biological assay, the vitamin C content of cooked amaranth and of the soup was determined.

After 2 min. of rapid boiling in an open vessel the amaranth showed an increase of about 10 percent in the total ascorbic acid content. When the amount of water was equal in weight to the amount of amaranth, approximately one-third of the ascorbic acid content was present in the soup and two-thirds was retained in the vegetable. The ascorbic acid content of the soup increased as the amount of water was increased. The biological activity of the soup agreed with its ascorbic acid content, as determined by chemical titration. The rate of loss of ascorbic acid from the cooked amaranth and from the soup was about 10 percent in the first hour and slower during the subsequent hours.

Losses of vitamin C during the cooking of peas, F. Fenton, D. K. Tressler, and C. G. King (*Jour. Nutr., 12 (1936), No. 3, pp. 285–295, figs. 4*).—In this study conducted at the New York State Experiment Station, with the cooperation of the New York State College of Home Economics and the University of Pittsburgh, determinations were made on the amount of ascorbic acid retained in cooked peas and in the cooking water at the "done" stage and at various intermediate stages. The cooking time, counted from the time the water came back to the boil, was 14 min. for the Thomas Laxton and 13 min. for the Alderman varieties. The total range of acidity of the raw and cooked peas was from pH 6.3 to 6.88, and the pH of the cooking water changed from 7.5 at the beginning to 6.5 at the done stage. Samples of the peas and of the cooking water were removed at intervals from the beginning of cooking to the overdone stage and at the done stage for normal cookings in which previous sampling had not been made. The Bessey and King technic (E. S. R., 71, p. 137) was followed, using trichloroacetic acid to give a clearer extract of peas. Biological assays were made on the raw and done peas by the method previously described (E. S. R., 76, p. 726).

Raw Thomas Laxton peas contained 0.23 mg and raw Alderman 0.24 mg of vitamin C per gram. The total destruction of vitamin C in Thomas Laxton at the done stage was 10 percent, 42 percent being retained in the peas and 48 percent in the cooking water, while Alderman showed a total destruction of 7 percent, 53 percent being retained in the peas and 40 percent in the cooking water. The greatest loss of vitamin C occurred during the first 2 min. of cooking, when the water was returning to the boiling point. The rate of loss after the initial destruction was very low and decreased almost to 0. There was a slight increase in vitamin C content when the peas were overcooked. The loss of vitamin C from drained cooked peas of the Telephone variety left exposed to the air at room temperature was very slight, amounting to about 9 percent during the first 5 min. and increasing to 14 percent at the end of the 70-min. period.

Carbon dioxide storage.—X, The effect of carbon dioxide on the ascorbic acid content, respiration, and pH of asparagus tissue, N. C. Thornton (*Contrib. Boyce Thompson Inst., 9 (1937), No. 2, pp. 137–148, figs. 2*).—In continuation of a series of studies (E. S. R., 74, p. 464), the author presents the results of an investigation to show that the ascorbic acid content of asparagus tissue was reduced by from 8 to 52 percent and the rate of respiration was retarded by storage in an atmosphere containing carbon dioxide, with the vegetable at a temperature between 2° and 27° C. either during or following the storage period. The greatest loss occurred during the early hours of exposure to the carbon dioxide and took place to the greatest extent in the bud tissue. There was no recovery of the ascorbic acid content upon exposure of the tissue to the air after the carbon dioxide treatment.

The effect of the administration of acid and alkaline salts upon the ascorbic acid content of guinea pig tissues, E. E. Hawley, R. G. Daggs, and D. J. Stephens (*Jour. Nutr., 14 (1937), No. 1, pp. 1–8*).—The results obtained

in a previous study conducted on human subjects (E. S. R., 77, p. 282) and the findings of a preliminary experiment on guinea pigs prompted the authors to investigate further the possible relationship of the administration of acid and alkaline salts to the amount of ascorbic acid retained in the liver and adrenals of guinea pigs maintained on the Sherman vitamin C-deficient diet. At depletion three groups of animals were fed daily 10 mg of ascorbic acid alone and with 32.5 mg of ammonium chloride or 100 mg of sodium bicarbonate, and subgroups were killed after 2-, 4-, 6-, 8-, and 15-day periods. One group was given an adequate amount of vitamin C for an extended 23-day period, while another group was killed at the end of the 17-day depletion period. At autopsy the Sherman, La Mer, and Campbell scurvy score was used to express the degree of scurvy, and the filtrate obtained from the acid-extracted tissue of the adrenals and livers was titrated against a standardized solution of 2,6-dichlorobenzenoneindophenol. The H-ion concentration of the urine was determined colorimetrically.

The reults indicate that the administration with ascorbic acid of sufficient sodium bicarbonate to yield a highly alkaline urine increased the retention of the vitamin. It would appear that when vitamin C is ingested in its natural form, as in cabbage, alfalfa hay, and orange juice, there is a better retention by the tissues. "It is shown that increased retention of ascorbic acid in the tissues may be at least a partial explanation of the decreased urinary output of ascorbic acid observed in humans in whom the urine had been rendered alkaline by the administration of sodium bicarbonate."

Experimental production of the diffuse alveolar bone atrophy type of periodontal disease by diets deficient in ascorbic acid (vitamin C), P. E. Doyle, O. Bessey, and S. B. Wolbach (*Jour. Amer. Dental Assoc. and Dental Cosmos, 24 (1937), No. 11, pp. 1768–1777, figs. 11*).—The authors discuss the production of the diffuse atrophy type of pyorrhea in the guinea pig by means of diets deficient in vitamin C. It is concluded that "the essential characteristics of ascorbic acid deficiency and of diffuse alveolar bone atrophy pyorrhea are identical and may be summarized as an inability of bone and connective tissue to withstand functional stress. The gross, X-ray, and histologic variations in the periodontal tissues of the guinea pig maintained on diets deficient in ascorbic acid are pathogonomic of scurvy and reproduce the diagnostic features recognized as characteristic of human diffuse atrophy pyorrhea."

The relation of vitamin D to skin respiration, A. K. Presnell (*Jour. Biol. Chem., 121 (1937), No. 1, pp. 5–8*).—Using the Warburg apparatus, the oxygen uptake of the skin of white rats maintained on the Steenbock rickets-producing diet No. 2965 was determined. That vitamin D has an effect upon the respiration of the skin was demonstrated in that the oxygen uptake of the skin of rachitic rats was only 60–70 percent of that of the rats receiving vitamin D. The addition of vitamin D to the deficient diet resulted in recovery of the rats from rickets and improvement in the skin respiration.

The absorption of vitamin D through the skin.—I, Speed of absorption of vitamin D through the skin. II, Efficiency of absorption of vitamin D through the skin, A. C. Helmer and C. H. Jansen (*Studies Inst. Divi Thomae, Athenaeum Ohio, 1 (1937), No. 1, pp. 83–98, pls. 2; 99–108, pls. 2*).—In part 1 the results of a series of tests are presented to show that 5-min. applications twice daily for 15 days of 1 cc of a soap solution containing 4 U. S. P. units of vitamin D to a clipped area on the back of the neck was sufficient to almost completely cure severe rickets in a group of 5 rats maintained on a rachitic diet. A seasonal variation was indicated, with the absorption of vitamin D through the skin being more rapid in the winter months than during the summer months.

In part 2 the curative effect of the topical application to rachitic rats of 1 U. S. P. unit of vitamin D in the form of viosterol in olive oil was compared with the oral administration of the vitamin. The X-ray results show that vitamin D is absorbed through the skin about as efficiently as through the digestive tract. The rats maintained at a room temperature of about 90° F. showed a greater degree of rickets than those maintained at a temperature of 70°.

Effect of vitamin D on growth of tubercle bacilli, W. STEENKEN, JR., and E. R. BALDWIN (*Soc. Expt. Biol. and Med. Proc., 37 (1937), No. 2, pp. 348–350*).—The addition of from 100 to 400 U. S. P. units of vitamin D to synthetic media seeded with Ra and Rv variants of strain H_{37} of *M[ycobacterium] tuberculosis* did not change the virulence or growth characteristics of the bacilli.

[Enzymic efficiency in avitaminosis, V, VI] (*Soc. Expt. Biol. and Med. Proc., 35 (1936), No. 1, pp. 209–211*).—In continuation of a series of papers, some of which have been noted (E. S. R., 74, p. 890), two papers are presented.

V. *Vitamin D deficiency on concentration of blood and tissue enzymes of the albino rat,* B. Sure, M. C. Kik, and K. S. Buchanan (pp. 209, 210).—Groups of rats maintained on the Steenbock-Black rachitogenic diet, with the modification as previously described to eliminate the influence of the plane of nutrition, were used to determine blood serum amylase, esterase, and phosphatase. Twenty-four groups showed severe, 4 advanced, 8 moderate, and 2 mild rickets when judged by the line test. The results of 658 titration determinations showed that no noteworthy changes appeared in the concentration of blood and tissue enzymes in rickets developed in the rat compared with enzyme concentrations on the same diet supplemented with vitamin D by irradiation of the rachitic ration. "The significant point in this study is the failure to obtain in experimental rickets large increases in concentration of blood serum phosphatase observed in human rickets. . . . It would appear then that experimental rickets is not the analogue of human rickets as it is generally assumed."

VI. *Deficiency of vitamins A and B complex in concentration of blood and tissue enzymes of albino rat,* B. Sure and K. S. Buchanan (pp. 210, 211).—The authors submit summarized data on the influence of multiple avitaminosis on the concentration of blood and tissue enzymes in rats. The results of 304 titrations show that the enzyme concentration was not increasingly disturbed by the multiple avitaminosis of vitamins A and B complex. The vitamin A deficiency was found to be responsible for a marked decrease in blood serum esterase and the vitamin B_1 deficiency for a pronounced decrease in pancreatic esterase and a moderate decrease in hepatic lipase.

Enzymic efficiency in avitaminosis.—VII, Peptic digestion in vitamin B deficiency, B. SURE and R. T. HARRELSON (*Amer. Jour. Digest. Diseases and Nutr., 4 (1937), No. 3, pp. 177–179*).—In this paper, which is one of the series noted above, the authors studied peptic digestion in vitamin B complex- and vitamin B_1-deficient rats, using the paired feeding technic. The results demonstrate that there is no significant change in the rate of peptic digestion between rats maintained on vitamin B complex- and vitamin B_1-deficient diets and litter mate controls of the same sex restricted to the same plane of nutrition.

Physiologic principles in the treatment of anemia, W. DAMESHEK (*New England Jour. Med., 217 (1937), No. 21, pp. 815–827, figs. 5*).—The importance of multiple etiologic factors leading to an iron deficiency or a liver extract deficiency state is stressed in this review paper, which discusses methods of treatment for hypochromic, pernicious, aplastic, and "Tallqvist" anemias and the conditions associated with them.

Treatment of human pellagra with nicotinic acid, P. J. FOUTS, O. M. HELMER, S. LEPKOVSKY, and T. H. JUKES (*Soc. Expt. Biol. and Med. Proc., 37 (1937), No. 2, pp. 405–407*).—In continuation of a previous study (E. S. R., 76,

p. 886), the authors report the results of feeding nicotinic acid to four pellagrins. The patients upon admission to the hospital were given the pellagra-producing corn diet, and after 3 days one patient received 1 g of nicotinic acid and the others 500 mg daily. Improvement in general condition and mental attitude was noted within 48 hr. in all the patients, the stomatitis was completely healed within 5 days, and the dermatitis had disappeared by the twenty-fifth day. It is noted that all the patients had sensations of heat and tingling of the skin immediately following the ingestion of the nicotinic acid, accompanied by dilation of the peripheral blood vessels and a slight temporary fall in blood pressure, and in two patients neuritic pains developed in the lower extremities during therapy.

The effect of the acid-base content of the diet upon the production and cure of rickets, with special reference to citrates, A. T. SHOHL (*Jour. Nutr., 14 (1937), No. 1, pp. 69–83, fig. 1*).—The author extended the investigation of the effect of the ingestion of acid by rachitic rats (E. S. R., 68, p. 871) to a study of the ingestion of citric acid-sodium citrate mixtures with different types of experimental rachitic diets. The component salts of the test mixture were added separately and in combination, as were the other organic acids, acetic, lactic, malic, malonic, succinic, and tartaric, and their sodium salts. Evidence is presented to show that changes in the acid-base balance of the experimental diet in which calcium and phosphorus are the main variables can convert a non-rickets-producing diet into a rickets-producing diet and vice versa.

Environmental temperature as a factor in the production and in the cure of rickets in the rat, N. B. GUERRANT, R. A. DUTCHER, and R. CROWTHERS (*Jour. Nutr., 14 (1937), No. 5, pp. 471–480, fig. 1*).—In this contribution from the Pennsylvania Experiment Station, the authors present the results of a series of tests using room temperatures of 73°, 84°, and 100° F., and carefully selected test rats receiving a uniform rachitogenic diet. The stages of calcification measured by the line test, bone analysis, and serum calcium and phosphorus determinations showed that environmental temperature is not an important factor in the production or the cure of rickets in rats.

Failure of abundant sunshine to protect against rickets, C. U. MOORE, J. L. BRODIE, A. J. THORNTON, A. M. LESEM, and O. B. CORDUA (*Amer. Jour. Diseases Children, 54 (1937), No. 6, pp. 1227–1238, figs. 5*).—A comparative clinical study of 943 5-year-old children revealed that the percentage of rickets was nearly as great in the San Diego, Calif., as in the Portland, Oreg., group, with over 90 percent of the children exhibiting three or more signs of rickets. It appears that under modern living conditions abundant sunshine does not furnish adequate protection against rickets, since Portland, with greater extremes both of temperature and of humidity, had an average of 2,194 hr. of sunshine per year, 38 percent lower than that reported for San Diego.

Precise evaluation of ultraviolet therapy in experimental rickets, J. W. M. BUNKER and R. S. HARRIS (*New England Jour. Med., 216 (1937), No. 4, pp. 165–169, figs. 2*).—The number of ergs required to produce a "narrow continuous line of calcification" in about 300 rachitic rats was determined by irradiation with ultraviolet light from a quartz mercury arc passed through a quartz monochromator and measured by photochemical and physical methods.

The antirachitically effective lines were found to be within the zone of from 2,537 to 3,025 a. u., inclusive, with distinct differences noted in the relative antirachitic efficiencies of light of the different wavelengths. To produce rachitic healing equivalent to that produced by 3 international units of vitamin D, the following energies were required: 775,000 e at 2,537 a. u., 660,000 at 2,652, 600,000 at 2,804, 420,000 at 2,967, and 900,000 e at 3,025 a. u. The differences may be attributed in part to differences in absorption of the various wavelengths by the skin and to the absorption spectrum of the provitamin.

TEXTILES AND CLOTHING

Textile fibers and their use, K. P. Hess, edited by B. R. Andrews (*Chicago: J. B. Lippincott Co., [1937], 2. ed., rev., pp. XVI+374, figs. 198*).—The subject matter presented in the first edition (E. S. R., 66, p. 693) has been revised and expanded to cover the new developments in the field of textiles.

Textile testing, J. Lomax (*London and New York: Longmans, Green & Co., 1937, pp. VIII+176, pls. 12, figs. [20]*).—This textbook is designed for use as a guide "for students, factory testers, and others engaged in the textile trade." The subject matter is divided into 10 sections dealing with the identification of textile fibers; the systems of weighing, sampling, and the methods of calculation; the condition and count of the yarn; the length, strength, and twist of the yarn and the fabric weight; humidity control and statistical treatment of the results; wool and cotton qualities; tests on silk, rayon, and wool; the fastness of dyed goods and fabric and fiber shrinkage; chemical damage on cotton; and calculation tables.

A comparison of certain physical properties of five kinds of wool, D. Saville and J. R. Hoehn (*S. Dak. Acad. Sci. Proc., 17 (1937), pp. 66–68*).—In this summary of a portion of a study being conducted at the South Dakota Experiment Station and previously noted as in progress (E. S. R., 77, p. 140), the authors report findings which show that in wool obtained from five breeds of sheep the crimp was lower in the wool from the thigh than in that from the shoulder and middle. The wool of the Rambouillet had the least variation in diameter and length throughout the entire fleece, while the size of the wool fibers from the thigh of the Tailless breed showed the greatest variation.

HOME MANAGEMENT AND EQUIPMENT

Family living on poorer and better soil, D. Dickins (*Mississippi Sta. Bul. 320 (1937), pp. 46*).—This study is based upon information concerning the manner of living during 1934 of 250 farm families on poorer soil and 250 of similar composition living on better soil in three counties in Mississippi. Each group was composed of 125 white and 125 Negro families farming on a small scale and about two-thirds of the white and one-third of the Negro families were landowners. The white families on the poorer soil averaged 4.3 persons per family and 4.8 on the better soil as compared to 4.9 and 5.3 persons, respectively, for the Negro families. The information was obtained by the interview method, supplemented by the use of schedules. Data are presented on the main sources of income, main cash crop, source of cash income, percentage distribution of cash income from the sale of farm products, gross value of farm products produced by the homemaker, total cash expenditures including expenditures for food and amounts of food canned and kinds of game secured, clothing and personal items, house furnishings and household operation, sickness and death, the activities engaged in and the organizations with which members of the family were affiliated, the tenure of living on the farm, and the formal education of all persons over 18 yr. of age.

Analysis of the data shows that the families on better soil had greater cash incomes with relatively more of their income derived from the farm and, likewise, greater cash expenditures for family living than had the families living on poorer soil. However, soil fertility would appear to be only one factor affecting the manner in which the farm family lives.

The appendix contains the score cards and supplementary tables.

Living rooms of low-income farm families of Mississippi, D. Dickins (*Jour. Home Econ., 29 (1937), No. 10, pp. 702–709*).—The data presented are

taken from the larger study noted above. The results of the application of a modification of the Chapin Social Status Scale, which measures the socioeconomic status of a family by the material objects in the living room, to 136 white and 145 Negro families with annual cash expenditures not over $500 suggest that the socioeconomic class to which the scores assigned a family "depended on the amount of cash expenditures for family living, on the formal education of the adult members, on the number and age of the members of the family, and on the type of farm tenure (owner, tenant, or cropper). The scores for families with greater expenditures, more schooling, older members, and farm ownership more often fell into the higher classifications."

The hygiene of housing (*League of Nations Health Organ. Bul., 6 (1937), No. 4, pp. 505–550*).—This contains the separate reports of the housing commission, the committee on the hygiene of environmental conditions in the dwelling, and the committee on noise and housing.

Household equipment [studies by the Maine Station] (*Maine Sta. Bul. 387 (1937), pp. 207–211*).—This progress report summarizes further studies by M. M. Monroe and P. S. Greene on the economical management of kerosene cook stoves to secure palatability of product in Maine farm households (E. S. R., 77, p. 141) and on the economic utilization of electricity in food preparation in Maine rural homes (E. S. R., 77, p. 735) from the standpoint of the effect of the method of heat application, and accompanying oven conditions, upon flavor and texture of baked foods.

MISCELLANEOUS

List of bulletins of the agricultural experiment stations for the calendar years 1935 and 1936, C. E. Pennington (*U. S. Dept. Agr., Misc. Pub. 294 (1938), pp. 94*).—This list, arranged by States and containing author and subject indexes, supplements that previously noted (E. S. R., 75, p. 141).

Accomplishments of the Colorado Experiment Station (*Colorado Sta., [1937], pp. 16, figs. 5*).—This brief review of the first 50 yr. is referred to editorially on page 3 of this issue.

Report of progress [of Maine Station] for year ending June 30, 1937, [F. Griffee et al.] (*Maine Sta. Bul. 387 (1937), pp. 157–262, figs. 9*).—This bulletin contains data noted for the most part elsewhere in this issue or previously.

Forty-eighth Annual Report [of New Mexico Station, 1937], F. Garcia (*New Mexico Sta. Rpt. 1937, pp. 80, figs. 14*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Fiftieth Annual Report [of Cornell Station], 1937, C. E. Ladd (*[New York] Cornell Sta. Rpt. 1937, pp. 50–173, pl. 1, figs. 3*).—This is the fiftieth annual report of the station, and is made up mainly of a historical review of research during that period. The experimental work reported is for the most part noted elsewhere in this issue.

Fifty-eighth Annual Report of the North Carolina Agricultural Experiment Station, [1935], R. Y. Winters et al. (*North Carolina Sta. Rpt. 1935, pp. 81, fig. 1*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Forty-ninth Annual Report [of Texas Station], 1936, A. B. Conner et al. (*Texas Sta. Rpt. 1936, pp. 346*).—The experimental work not previously reported is for the most part noted elsewhere in this issue.

Forty-seventh Annual Report of [Wyoming Station, 1937], J. A. Hill (*Wyoming Sta. Rpt. 1937, pp. 52*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue. Meteorological data are also included.

NOTES

Alabama Polytechnic Institute.—Dr. Bradford Knapp, president from 1928 to 1932 and widely known for his services to southern agriculture and education, died June 11 at Lubbock, Tex., where he had been president of the Texas Technological College since 1932. Dr. Knapp, the son of Dr. Seaman A. Knapp, was born in Iowa December 24, 1870, attended the Iowa College for 2 years, and was graduated form Vanderbilt University in 1892. Later he received the LL. B. degree from the University of Michigan in 1896 and that of D. Agr. from the Maryland State College in 1918. He served as special agent and assistant in the farmers' cooperative demonstration work of the U. S. Department of Agriculture from 1909 to 1911 and was in charge of this work after the death of his father until 1915. He was then appointed chief of the Office of Extension Work in the South in the States Relations Service, becoming dean and director of the Arkansas University and Station in 1920 and president of the Oklahoma College in 1923.

Illinois University and Station.—Dean and Director H. W. Mumford, who was seriously injured in an automobile collision on May 14, died May 31. An account of his life and services will appear later.

Dr. J. C. Blair, chief of the department of horticulture, has also been appointed dean of the College of Agriculture, director of the station, and director of the extension service in agriculture and home economics.

Kansas College and Station.—Dr. Alfred E. Aldous, professor of agronomy and in charge of cooperative investigations in pasture improvement, died May 4 at the age of 51 years. Dr. Aldous was born in Ogden, Utah, and graduated from the Utah College in 1910. He carried on graduate work in the Universities of Minnesota and Nebraska, receiving the Ph. D. degree from the latter in 1934. He was associated for several years with the grazing and range research of the U. S. D. A. Forest Service, coming to Kansas in 1926. At the time of his death he was giving special attention to experimental work in developing drought-resistant grasses for Kansas and the Southwest.

Mississippi College and Station.—Dean and Director J. R. Ricks has been killed in an automobile accident, dying in Birmingham, Ala., on June 1. A native of Mississippi, he was graduated from the college in 1902, received the M. S. degree in 1906, and served successively as assistant in agriculture, associate professor of agronomy and station agronomist, and vice director and director (from 1919 to 1930). After brief periods with the U. S. D. A. Bureau of Animal Industry and as director of the Virgin Islands Experiment Station, he returned to Mississippi as director of the station and dean of the School of Agriculture in 1932, and 3 years later also became director of extension. He played a prominent part in the upbuilding of the station, serving energetically and effectively, often under difficult circumstances. In his stead the assistant director of the station, Dr. Clarence Dorman, has been appointed acting director.

North Dakota Station.—Dr. Warren C. Whitman has been appointed assistant botanist in charge of grassland research.

Wyoming Station.—Dr. William G. Bradley has been appointed assistant pharmacologist as of June 1. T. J. Dunnewald, assistant in soils investigation, and Dr. L. H. Scrivner, assistant veterinarian, have been granted sabbatical leave for the year 1938–39.

EXPERIMENT STATION RECORD

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THE SERVICE TO THE STATIONS OF THE MUMFORD BROTHERS

Some months ago the retirement of Dr. Frederick B. Mumford as dean of the College of Agriculture of the University of Missouri and director of the Missouri Experiment Station was announced, to become effective on September 1, 1938, thereby terminating an administrative leadership of over 28 years. An additional and even earlier loss to the stations, however, has been unexpectedly occasioned by the death of his younger brother, Dean and Director Herbert W. Mumford of the Illinois University and Station. Severely injured in an automobile collision on May 14 while returning to Urbana from a trip undertaken in connection with his duties in the Federal Farm Credit Administration, the latter died on May 31 at the age of 67 years.

For years the careers of these brothers had been developing along such closely parallel lines that it had become more or less common to think of them collectively. Both were brought up on the family farms near Moscow, Mich., and both began their undergraduate work at Albion College and brought it to completion at the Michigan State Agricultural College. Graduating side by side there in 1891, each served his Alma Mater as assistants and professors of agriculture, the elder from 1891 to 1895 and the younger in his stead until 1901, and in 1927 they returned to receive together the honorary degree of doctor of agriculture. In the meantime, Dr. Frederick B. Mumford had cast his fortunes with Missouri, his brother with Illinois. There each in his own realm had become a professor of animal husbandry, a department head, a dean and director, and a leader of national prominence and international renown.

Notwithstanding these and other similarities, it is hardly necessary to point out that their careers have in no sense been duplicates. Each life has reflected a positive and distinctive individuality and has impressed itself indelibly upon their respective institutions and other spheres of influence.

As the elder of the pair, it has often fallen to the lot of Dr. Frederick B. Mumford to break new ground. In Michigan he gave the first organized course in livestock judging and planned one of the

earliest large-scale experiments in fattening sheep. Arriving in Missouri in 1895 as professor of agriculture at the age of 27 years, he played a prominent part in the development of the College of Agriculture and the upbuilding of the station. Mumford Hall, erected in 1923 as the administrative building of the group at a cost of $200,000, received its name in 1930 in honor of his achievements. It is stated that he has seen the student enrollment enlarged by 1,800 percent and the material resources increased tenfold. Likewise has the station prospered greatly under the administration of one who has been described by Dean and Director C. B. Hutchison of California as "a staunch advocate of the scholarly and scientific approach to solutions of the agricultural problems of [the] State and Nation—for nearly 30 years leader and builder of one of America's outstanding centers of agricultural education and research."

Dr. Herbert W. Mumford returned after graduation to the home farm for 4 years. This step doubtless greatly aided him in acquiring the insight remarked upon by Under Secretary of Agriculture M. L. Wilson at the fiftieth anniversary celebration of the Illinois Station, as follows: "Over these years, I have come to know Dean Mumford very well, and to regard him as a thoughtful, scientifically minded, wise, and judicious leader, who, though he occupied the position of a professional agricultural scientist and executive, never ceased to be at heart a farmer nor to maintain his characteristic understanding and sympathy for all of the problems of the average family on the farm."

Six years of effective service in the Michigan College in animal husbandry and agriculture preceded his appointment as animal husbandman in Illinois in 1901. In 1922 he succeeded Dean Eugene Davenport as dean of the College of Agriculture, director of the experiment station, and director of the extension service in agriculture and home economics. These activities have since continued to make the progress to be expected from the leadership of one who is referred to in a recent notice as "widely acknowledged as a keen and trustworthy investigator, as well as a wise administrator, an inspiring and challenging teacher, and a great and noble gentleman."

In the Association of Land-Grant Colleges and Universities both had long been active and outstanding. "Mumford of Missouri" has served on the executive committee since 1920, continuously as chairman of the joint committee on projects and correlation since its establishment in 1913, and for several years with the graduate study and other groups. A noteworthy feature of his association with the executive committee has been his work in connection with the drafting of the Purnell Act and his unfailing interest in and advocacy of cooperation and coordination of effort in research. "Mumford of Illinois" had held varied committee assignments, including that of experiment sta-

tion organization and policy, the joint committee on publication of research, and many special committees such as those on relationships, the agricultural situation, the land problem, phosphate resources, and stock-judging contests. Both have served as chairmen of the experiment station group, and Dr. H. W. Mumford as chairman of the section on agriculture. Each has also presented numerous papers before the association, the most recent being their anniversary addresses on Col. William H. Hatch and Jonathan Turner.

The parallelism which has been so striking a feature of their careers was continued to the end in the selection of their successors. In each case, these have been drawn from the staffs of their respective institutions. In Missouri, Prof. M. F. Miller, associated with the agronomic work since 1904 and chairman of the department of soils since 1914, has been appointed dean and director as of September 1, 1938. In Illinois, the more abrupt transition necessary was effected by the appointment on June 10 as dean and director of Dr. J. C. Blair, who has been associated with the horticultural work since 1896 and its head since the establishment of a distinct department in 1900. Inevitably the loss of such dominating personalities as the Mumfords will be keenly felt, but it appears that their own institutions have facilitated the task of readjustment by the policy which has been adopted of a continuance at the helm of leaders of long experience and thorough familiarity with local conditions and needs.

THE RETIREMENT OF WALTER HENRY BEAL

The retirement on June 30, 1938, of Mr. Walter Henry Beal not only ended a noteworthy career in the Federal Department of Agriculture of over 47 years, but also severed the last link between the present personnel of the Office of Experiment Stations and the original technical staff. His service has been well-nigh contemporaneous with that of the Office itself, far exceeding that of any other individual, and for some time his unique position has been recognized as comparable to that of the "dean of the corps."

From the beginning he has filled an important place in the organization, doing different things at different times but invariably doing them dependably and well. Coming to the Office in 1891, after graduating from the Virginia Polytechnic Institute in 1886 and with 4 years as assistant chemist in the Massachusetts Experiment Station, his early duties were mainly editorial, including such ventures as the Card Index of Experiment Station Literature and the compilation of Experiment Station Work and the first Farmers' Bulletins. Ultimately, this led to his editorial supervision of all publications

other than *Experiment Station Record.* In recent years he has given special attention to the assembling of the annual report on the work and expenditures of the experiment stations.

As regards *Experiment Station Record*, his name has been continuously associated with its staff of specialists since volume 1. The abstracting in agricultural meteorology, which Dr. F. V. Rand is now taking over, had known no other hand, while the sections of agricultural chemistry, soils and fertilizers, and agricultural engineering have from time to time been entrusted to his care. Special acknowledgment should also be made of his helpfulness editorially, no member of the staff having been more fertile of suggestions or constructive in comment.

Probably his outstanding service has been that rendered directly to the experiment stations in connection with the administration by the Office of the Federal funds for their support. For years he was one of the historic quartet—True, Allen, Beal, and Evans—who carried on the entire annual visitation of the stations, and he has long had a large share in the scrutiny of their projects and the rendering of advice and counsel. In these capacities he has revealed himself as discerning, appreciative, and constructive, and he has exercised a wider and more potent influence than has always been realized. Frequently he has served as the acting chief of the Office under difficult circumstances. Last December the value of Mr. Beal's services found recognition in the authorization by President Franklin D. Roosevelt of a special extension of 6 months beyond the customary retirement age.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Chemical investigations of the tobacco plant.—VII, Chemical changes that occur in stalks during culture in light and in darkness, H. B. VICKERY, G. W. PUCHER, A. J. WAKEMAN, and C. S. LEAVENWORTH (*Connecticut [New Haven] Sta. Bul. 407 (1938), pp. 107–131, figs. 4*).—In continuation of researches previously noted (E. S. R., 78, p. 293), a series of samples of stalks of tobacco plants, denuded of all leaf tissue, was subjected to culture in distilled water either in continuous light or in complete darkness. Analysis of the samples at intervals up to 332 hr. permitted many of the chemical changes that occur under these conditions to be followed. Toward the end of the period of study, both in light and in darkness, shoots appeared at many of the upper nodes of the stalks, those in light developing into small leaves, those in darkness being elongated, colorless, and stalklike with rudimentary leaflets.

The water content of the stalks changed very little. There was a prompt loss of about 5 percent in light and a barely significant gain in darkness. At the end, both series had lost about 10 percent of the water originally present.

The organic solids diminished appreciably in darkness, but there was no significant change in light. The loss in darkness appeared due to respiration, the apparent constancy in light indicating that photosynthesis had occurred to an extent sufficient to compensate for the losses due to respiration.

There was a prompt increase in the amide nitrogen and in the soluble amino nitrogen both in light and in darkness and a slow but significant increase in ammonia. Evidence of synthesis of glutamine in light was secured. It appeared probable that the metabolism of glutamine and asparagine is not essentially different from that of tobacco leaves. Quantitatively in relationship to the total mass of tissue it was of minor importance.

The total organic acids increased slightly early in the period of culture and thereafter slowly diminished to the quantity present at the start. Oxalic acid did not change in amount either in light or in darkness. Citric acid was present only in small quantities, but promptly increased in the dark by about 50 percent of that originally present and subsequently remained unchanged. In the light it diminished slightly. Malic acid is present in considerable amounts in tobacco stalk tissue. It increased both in darkness and in light during culture, though more slowly in darkness than in light. Its behavior in darkness was found to be entirely different from the behavior of the malic acid of tobacco leaves under similar conditions.

The carbohydrate metabolism of the stalk tissue of the tobacco plant was shown to differ sharply from that of the leaf. In the leaf, the carbohydrates rapidly increased during culture in the light until over 16 percent of the organic solids present consisted of soluble reducing substances. In the dark, the carbohydrates rapidly dropped to a very low level. In the stalk, both in light and in darkness, the soluble carbohydrate diminished with considerable rapidity.

The initial value was far higher than that found in leaves under ordinary conditions. The final value reached was comparable to values observed in normal leaves. The only apparent effect of illumination was to delay the disappearance of the carbohydrate, an effect that seemed to be most easily interpreted as indicating a partially compensatory photosynthesis. The oxidation processes affected both fermentable and unfermentable sugar in a substantially similar manner but did not appear to affect the sucrose to any significant extent.

Volatile oil in marjoram, J. F. CLEVENGER. (U. S. D. A.) (*Jour. Assoc. Off. Agr. Chem., 21 (1938), No. 1, pp. 109, 110*).—Factors involved in the determination of the oil are briefly discussed.

The magnesium-activated leucyl peptidase of animal erepsin, M. J. and G. H. JOHNSON and W. H. PETERSON (*Jour. Biol. Chem., 116 (1936), No. 2, pp. 515–526, figs. 2*).—Data are presented to show that leucyl peptidase is the chief leucyldiglycine hydrolyzing enzyme of hog erepsin. The method of preparing leucyl peptidase free from aminopolypeptidase is described.

Specificity of intestinal aminopolypeptidase, M. J. JOHNSON (*Jour. Biol. Chem., 122 (1937), No. 1, pp. 89–97*).—In continuation of the study noted above, the author demonstrates that the intestinal enzyme aminopolypeptidase is capable of hydrolyzing prolyl and methylated peptides and slowly attacks certain dipeptides. It would appear that the aminopolypeptidase does not require an inact amino group in its substrate but does need a basic nitrogen atom carrying at least one hydrogen atom.

Ascorbic acid oxidase from the white gourd (Benincasa criapra), B. GHOSH and B. C. GUHA (*Jour. Indian Chem. Soc., 14 (1937), No. 12, pp. 721–724*).—Following essentially the method described by Tauber et al. (E. S. R., 74, p. 442), the authors obtained from the white gourd (*B. criapra*) an ascorbic acid oxidase, 2 cc of which was capable of completely oxidizing 0.5 mg of ascorbic acid when incubated at 40° [C.] with 1 cc of a citrate phosphate buffer solution. The enzyme preparation was found to be incapable of oxidizing glutathione, cysteine, hydroquinone, and sodium thiosulfate, and is considered to be fairly specific for ascorbic acid. Potassium cyanide in M/1,000 concentration completely inhibited and sodium fluoride in M/10 concentration slightly inhibited the action of the oxidase.

Isolation of ascorbic acid from urine, C. P. STEWART, H. SCARBOROUGH, and P. J. DRUMM (*Nature [London], 140 (1937), No. 3537, p. 282*).—The authors report the isolation from urine of a small amount of a crystalline dinitrophenylhydrazine derivative which appears to be that of ascorbic acid.

The chemical identification of ascorbic acid in urine, P. J. DRUMM, H. SCARBOROUGH, and C. P. STEWART (*Biochem. Jour., 31 (1937), No. 10, p. 1874–1878, pl. 1*).—The preliminary report on the isolation of a derivative of ascorbic acid from normal urine is noted above. From 12 l of urine obtained from subjects receiving an ordinary mixed diet without ascorbic acid supplement, 20 mg of the pure 2,4-dinitrophenylhydrazine derivative of dehydroascorbic acid were isolated. The crystalline substance was shown to be identical with the pure ascorbic acid by the presence of broad diffuse absorption bands in the green portion of the visible spectrum, by photometer reading showing the distribution between two immiscible solvents, by the color reaction with sulfuric acid and sodium hydroxide, and by the close agreement in the melting points.

A simple test for vitamin C excretion in the urine by means of a reagent paper [trans. title], K. SCHEER (*München. Med. Wchnschr., 85 (1938), No. 7, pp. 256, 257, fig. 1*).—A rapid clinical test is described for the estimation of ascorbic acid in the urine based on the time required for decolorization of a test paper impregnated with dichlorophenolindophenol. One of the indicator

tablets is crushed to a fine powder, which is spread thinly over a sheet of filter paper and rubbed in with the dry finger until no flakes separate when the paper is immersed in the liquid. When a strip of the test paper is placed in a solution containing ascorbic acid, decolorization takes place with a rapidity depending upon the concentration of ascorbic acid. With a concentration of 100 mg per 100 cc, decolorization is complete in 5 sec., 50 mg in 8, 25 in 10, 12 in 11, 8 in 12, 7 in 15, and 4.5 mg in 25 sec. At a concentration of 4.5 mg percent and lower, the test paper is said to show a thin stripe of more rapid decolorization, followed after a considerable interval by decolorization of the whole. The appearance of this white zone is an indication of very low concentration beyond which the results are not clear-cut.

A possible discrepancy in the estimation of ascorbic acid in urine, G. W. T. H. Fleming and T. E. Burrows (*Brit. Med. Jour., No. 4023 (1938), pp. 333, 334*).—Doubt is thrown on the efficacy of sulfuric acid as a preservative of ascorbic acid in urine, as well as on the nature of the reducing substance in urine as measured by titration, with 2,6-dichlorophenolindophenol according to the micromethod of Birch et al. A water solution of ascorbic acid corresponding in concentration to amounts commonly found in urine underwent a 20-percent loss in 5 min. in the presence of a 1-percent solution of sulfuric acid and only 5 percent in the presence of 5 percent acetic acid. At the end of 24 hr. the respective losses were 100 and 29 percent. In similar tests with urine the losses in reducing substances amounted to 31, 16, and 19 percent, respectively. In urine of known content of titratable substances, and with a definite quantity of ascorbic acid added, losses amounted to 2, 16, and 1 percent, respectively, in the first 5 min. and 45, 28, and 22 percent in the subsequent 24 hr. Thus, while the loss of reducing substances was much more rapid in the first few minutes in the presence of sulfuric acid than of acetic acid, the destruction proceeded much more slowly in the next 24 hr. In similar tests with ascorbic acid added to urine which had been allowed to stand until it no longer gave a test for reducing substances, the losses after 24 hr. amounted to 100 percent in the untreated sample, 89 percent in the one to which 1 percent of sulfuric acid had been added, and 31 percent in the one with 5 percent acetic acid. In the opinion of the authors the results obtained in determinations of ascorbic acid in urine are of very doubtful value unless the titration is carried out immediately.

A note on the determination of blood ascorbic acid, A. Wilson (*Lancet [London], 1938, I, No. 12, pp. 667, 668*).—Because of the difficulty in determining the end point in the Farmer and Abt blood method and the later modification of Pijoan and Klemperer, as noted on page 282, a series of experiments was carried out to produce a suitable color standard for comparison. As the result of this study the following standard is proposed:

Two solutions are required from which the standard is prepared daily by mixing 0.5 cc of each solution and diluting the mixture to 35 cc with freshly boiled and cooled distilled water. Solution A is a solution of methyl red in alcohol prepared by dissolving on a warm water bath 0.002 mg methyl red in 0.76 cc N/20 of NaOH and 4 cc of 90 percent alcohol and diluting with 20 percent alcohol to 200 cc. Solution B is a buffer solution prepared by mixing 50 cc M/5 KCl with 2.62 cc N/5 HCl and diluting to 200 cc with freshly boiled and cooled distilled water.

Comparison is made in Pyrex tubes of 10 cm length, 1.5 cm external diameter, and 1.3 internal diameter, the tubes being set at an angle of 55° and the standard color delivered from a burette to exactly the same volume as that of the unknown.

The quantitative determination of ascorbic acid in the blood serum [trans. title], H. Lund and H. Lieck (*Klin. Wchnschr., 16 (1937), No. 16, pp. 555–557, fig. 1*).—This paper describes the technic for the determination of ascorbic acid

in blood plasma, following the method noted previously (E. S. R., 77, p. 742), but determining the end point by titration instead of with the colorimeter. In comparison with indophenol titration the methylene blue method gives very low values, for in the analyses reported the concentration of ascorbic acid in the blood serum of normal subjects was only about 0.3 mg per 100 cc before saturation and 1 mg per 100 cc 2 hr. after a test dose of 10 mg ascorbic acid per kilogram body weight. It is also noted that values obtained by Trier in the months of July and August averaged 0.4 mg per 100 cc for 156 healthy subjects.

Rapid method for the quantitative determination of reduced ascorbic acid in milk, P. F. Sharp (*Jour. Dairy Sci., 21 (1938), No. 2, pp. 85–88*).—The method of determining the content of reduced ascorbic acid in milk, as used in a study previously noted (E. S. R., 77, p. 95), is described in detail.

Comparative studies on methods of determining ascorbic acid [trans. title], A. Fujita and T. Ebihara (*Biochem. Ztschr., 290 (1937), No. 3–4, pp. 172–181, figs. 6*).—A critical review, with illustrative data, is given of the various methods in use for determining ascorbic acid, including the Tillmans, 2,6-dichlorophenolindophenol method as practiced by different investigators and particularly as modified by Fujita and Iwatake (E. S. R., 76, p. 155) through the use of 2 percent metaphosphoric acid as a stabilizing deproteinizing agent, the methylene blue method of Martini and Bonsignore (E. S. R., 73, p. 746), and colorimetric methods, including the one proposed by Fujita, Iwatake, and Miyata (E. S. R., 76, p. 155), with the conclusion that the indophenol method gives the most reliable results. The methods were tested on solutions of ascorbic acid alone and in the presence of known interfering agents. Urine and blood were not included.

Notes on the determination of ascorbic acid by the methylene blue method of E. Martini and A. Bonsignore [trans. title], A. A. Policard, M. Ferrand, and E. Arnold (*Bul. Soc. Chim. Biol., 20 (1938), No. 2, pp. 165–172, fig. 1*).—Precautions which must be taken in the methylene blue method of determining ascorbic acid as originally proposed by Martini and Bonsignore are noted, and data are reported on the accuracy of the test as applied to ascorbic acid solutions of known strength and to various organic tissues. Among the precautions noted are that the pH of the solution after buffering should be determined each time, that the source of light should not be too intense (a 500-w bulb is recommended) and that the distance between the lamp and the tube should be 20 cm, that the blank solution should be changed after five or six tests, that the purity of the reagents should be checked, and that the concentration of the liquid to be tested should be such that not more than 1.5 cc of the methylene blue solution is required. The test is considered capable of detecting 0.0045 mg ascorbic acid and to have a relative error of 5 percent. Although no claim for absolute specificity is made, the method is considered by the authors to be the least objectionable of those proposed.

A color test for thiamin (vitamin B_1), H. Tauber (*Science, 86 (1937), No. 2243, p. 594*).—"A few milligrams of thiamin (crystalline, synthetic, Merck) and about 5 mg of *p*-dimethylaminobenzaldehyde are placed in a small crucible, 0.1 cc of glacial acetic acid is added, and the mixture heated until all the acid is evaporated. After cooling, 1 drop of glacial acetic acid is added. An intense brick-red color develops immediately. The red compound is probably a Schiff's base, as most primary amines readily form colored condensation products with aldehydes. Proteins and amino acids interfere."

The chemistry of vitamin E.—Tocopherols from various sources, O. H. and G. A. Emerson, Ali Mohammad, and H. M. Evans (*Jour. Biol. Chem., 122 (1937), No. 1, pp. 99–107, fig. 1*).—In addition to the findings noted in a preliminary

report (E. S. R., 76, p. 148) of this study, conducted at the University of California, the authors describe the isolation of α-tocopherol from lettuce leaves and palm oil, and of β-tocopherol from wheat-germ oil, and γ-tocopherol from cottonseed oil. The α-tocopherol appeared identical in vitamin E activity with the allophanate preparation from wheat-germ oil, and the β- and γ-tocopherol possessed about one-half to one-third the vitamin E potency of α-tocopherol.

A simple direct reading photoelectric colorimeter, J. and R. J. LEBOWICH and M. DINBURG (*Jour. Lab. and Clin. Med., 23 (1937), No. 3, pp. 284–292, figs. 6*).—The design, operation, and method of using a simple direct reading photoelectric colorimeter are described. The range of the instrument is limited in that as the concentration of the test solution is increased the amperage of the cell decreases, so that in the higher concentrations the electrical values become too small to be detected. The scope of the instrument is adequate for blood chemistry, the purpose for which it was designed. The use of color filters would increase the accuracy of the instrument, but would diminish the range by rapidly increasing the rate of light absorption, particularly in the higher concentrations. The inherent error of the instrument is about 1 or 2 percent.

Determination of deuterium in organic compounds, A. S. KESTON, D. RITTENBERG, and R. SCHOENHEIMER (*Jour. Biol. Chem., 122 (1937), No. 1, pp. 227–237, figs. 6*).—The modifications of the methods for the determination of deuterium in small samples of organic compounds described previously (E. S. R., 78, p. 275) are given in detail. The deuterium content of the finally purified water is determined by two independent methods instead of repurification of the water and redetermination by the same analytical procedure.

A comparison of the results of rapid tests with the amounts of available nutrients obtained by quantitative methods on Maryland soils, R. P. THOMAS and R. C. WILLIAMS. (Md. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc., 1 (1936), pp. 243–254*).—"The short tests for organic matter gave consistently lower values. The results of the two methods for calcium were similar for the Piedmont soils. The rapid tests showed slightly more available calcium in the limestone soils and slightly less in the Coastal Plains, mountain, and Appalachian Plateau, and bottom-land and terrace soils. In the magnesium tests, the short method did not remove all the available magnesium. This test did indicate the small and excessive amounts of this ion. The quick tests for potassium gave slightly lower results for the Coastal Plain, Piedmont, mountain soils and bottom-land soils, and higher values for the limestone soils. The results for manganese by the rapid test compared very favorably with those found in exchangeable form, especially in the higher and lower amounts. Practically the same amount of available phosphorus was obtained by the two procedures. The short method gave slightly higher values for nitrate nitrogen. The average of all the soils in the State showed a good agreement between the two methods."

Calibrating soil tests for available potassium, R. H. BRAY. (Ill. Expt. Sta.). (*Soil Sci. Soc. Amer, Proc., 1 (1936), pp. 225–231*).—Studies of various phases of the extraction and precipitation and of the reading of the tests indicate that as an extractant "the ideal solution for a quick test would naturally be one of sufficient concentration to drive practically all of the replaceable K into solution." A 25 percent solution of sodium perchlorate was found especially effective from this point of view. Mixing the soil with the solution and pouring the mixture on a filter was found to effect an extraction more complete than that obtained in placing the soil in the filter and pouring the extractant through it. Forming a layer of alcohol above the solution and mixing by gentle shaking was the most satisfactory of various methods of using alcohol to pre-

cipitate the cobaltinitrite compound. The relative turbidity of the precipitate was most accurately read by a procedure in which, "with a calibrated medicine dropper, the turbid solution or developed test is measured into a flat-bottom vial until the very thin black lines on the turbidity chart are obscured. The milliliter of developed test necessary to obscure the lines are translated into pounds per acre of K by means of a conversion table which in turn is calibrated with soils of known replaceable K content or with standard potassium solutions. With a 5 to 10 soil-solution extraction, the reading range is from about 40 to 300 lb. per acre and easily adjusted to the higher ranges by diluting the filtrate."

The insoluble residue in the potassium chloroplatinate obtained in the analysis of certain fertilizers for potash, H. R. Allen. (Ky. Expt. Sta.). (*Jour. Assoc. Off. Agr. Chem., 21 (1938), No. 1, pp. 134–140*).—When the ignition was carried out "at the lowest practical temperature to assure a perfectly white residue, in some cases, particularly when organic material was present in the fertilizer, considerable insoluble residue resulted, the amount of which was determined by the difference in weight of the crucible originally and after washing out the K_2PtCl_6. Since the Official method does not specify this latter procedure, any insoluble material would be counted as K_2PtCl_6." The analyses reported indicate for the most part that the quantity of insoluble residue was smaller with higher temperature of ignition except when silica dishes were used in the muffle; that the quantity of K_2PtCl_6 was larger with higher temperature of ignition; that more potassium, with less insoluble residue, was obtained in platinum than in silica dishes, with higher temperature of ignition; and that, apparently, in the determination of potassium in fertilizers, ignition of the sulfates at about 750° C. is preferable to ignition at a lower temperature.

Direct determination of available P_2O_5 content of fertilizers, W. H. MacIntire, W. M. Shaw, and L. J. Hardin. (Tenn. Expt. Sta.). (*Jour. Assoc. Off. Agr. Chem., 21 (1938), No. 1, pp. 113–121, figs. 2*).—A modified available phosphate solvent, together with a method requiring steam digestion of the sample with the extracting mixture is reported. The authors direct that one prepare a stock solution, each liter to contain 80 g of P_2O_5-free NH_4NO_3, 50 cc of 1 M citric acid, and 75 cc of 1 M NH_4OH. This dual salt solution (1 M nitrate –0.05 M citrate) should have a pH of 4.2. They found this method to have numerous advantages over current procedure.

Losses of chlorine in different materials with various ashing temperatures, T. A. Pickett. (Ga. Expt. Sta.). (*Jour. Assoc. Off. Agr. Chem., 21 (1938), No. 1, pp. 107, 108*).—At temperatures up to and including 600° C. for two ashings of 1 hr. each, the samples tested were ashed with a negligible loss, if any, of chlorine, provided sodium carbonate was present in excess. Increasing the period of ashing made no material difference in the loss of chlorine. Many of the materials analyzed, including potassium chloride, turnip tops, tankage, and fish meal, could be ashed safely at 650° when sodium carbonate was present in sufficient amounts, but none of the samples could be ashed at 800° without a considerable loss of chlorine. A large amount of chlorine was lost from some samples even at 500° when there was not an excess of sodium carbonate present.

Soil and plant tissue tests for minor element constituents, M. F. Morgan, (Conn. [New Haven] Expt. Sta.). (*Soil Sci. Soc. Amer. Proc., 1 (1936), pp. 255–257*).—The adaptability of the soil extract prepared by means of the "Universal" soil extracting solution to the series of tests previously described (E. S. R., 73, p. 746) suggested "the possibility of developing similar tests for other minor elements that may be in deficiency or in harmful concentrations,

such as boron, copper, and zinc." Procedures that give tests for these elements when they occur in toxic concentrations have been developed. The manganese test has been increased in sensitiveness to a degree such that if the test be negative, "the soil may be expected to contain not more than 1 p. p. m. of active manganese. This is considered definitely deficient on all soils at 6.4 pH or higher." The iron test has been modified to the extent of the substitution of the use of thiocyanate in place of ferricyanide. Under the conditions described for the test "a barely perceptible trace of red color represents about 1 p. p. m. of active iron in the soil." A new boron test, based upon the color reaction of boric acid with constituents of turmeric extract, has been shown to be sensitive to about 2 p. p. m. The new copper test, depending upon a color reaction with α-benzoinamine, yields "a barely perceptible trace of greenish-yellow color . . . when approximately 2 p. p. m. of copper is present in the extract. The color deepens in greenish hue, with higher amounts, being quite definite at 5 p. p. m., and at 10 p. p. m. a good apple-green color is developed." In the zinc test, also new, the soil extract is treated with reagents containing cobalt chloride, mercuric chloride, and ammonium thiocyanate. Ether is then added. "The appearance of a blue color at the film of contact between the ether and the aqueous solution is evidence of zinc. A barely perceptible film of blue indicates approximately 10 p. p. m. in the extract. Above about 25 p. p. m. a blue precipitate begins to accumulate in the bottom of the vial."

The hydrolysis of Willstätter lignin from wheat straw, M. Phillips. (U. S. D. A.). (*Jour. Assoc. Off. Agr. Chem., 21 (1938), No. 1, pp. 145–148*).—In a further investigation of his own method for the determination of lignin, the author subjected Willstätter lignin from wheat straw to alternate treatment with cold fuming hydrochloric acid and boiling 5 percent hydrochloric acid. A portion of the lignin complex as a whole was thereby hydrolyzed, as indicated by the fact that the percentage methoxyl in the residual lignin remained the same as in the original lignin.

Effect of various carbohydrate materials on the determination of lignin by the fuming hydrochloric acid method, M. Phillips and M. J. Goss. (U. S. D. A.). (*Jour. Assoc. Off. Agr. Chem., 21 (1938), No. 1, pp. 140–145*).—In this investigation of the action of 42–43 percent and 5 percent hydrochloric acid on various carbohydrates in relation to the determination of lignin by the method of Goss and Phillips (E. S. R., 76, p. 153), insoluble humin-like materials were obtained only in the case of fructose, sucrose, inulin, and pectin. The percentages of insoluble material were much less than those recorded in the literature. It is pointed out that the preliminary extraction of the plant material with hot water and 1 percent hydrochloric acid would remove effectively any of the interfering carbohydrates and would, therefore, not interfere appreciably with the determination.

The detection of vegetable gums in dairy products, P. A. Racicot and C. S. Ferguson (*Jour. Assoc. Off. Agr. Chem., 21 (1938), No. 1, pp. 110–112*).—Trichloroacetic acid solution is used for separation of the milk protein from the gum. Of locust bean gum, gum tragacanth, gum arabic, or agar, a quantity sufficient for detection passes into the filtrate. The gum is precipitated from the filtrate by alcohol. The character of the precipitate gives some indication of the identity of the gum present. After precipitation the gum is washed thoroughly to remove all lactose originally present. This is best accomplished by centrifuging and decanting. After being washed the precipitate is tested, first to make sure it is free from reducing substances and protein matter, and second to show that it does contain carbohydrate material. It is then subjected to hydrolysis and again tested for the presence of reducing substances. If reducing sub-

stances are now found the presence of a vegetable gum is established. To prove the identity of the gum a further test is made with phenylhydrazine, the osazones being examined microscopically.

Determination of nicotine on apples sprayed with nicotine bentonite, L. N. Markwood. (U. S. D. A.). (*Jour. Assoc. Off. Agr. Chem., 21 (1938), No. 1, pp. 151–155*).—Although sodium hydroxide solution removes nicotine effectively from the fruit, the use of a strongly alkaline solution for dipping the fruit in an open beaker risks a loss of nicotine. A hydrochloric acid dipping solution removed less than one-fourth of the total nicotine when the alkaloid had been applied in the form of the bentonite adsorbate.

To avoid these errors the author tried base-exchange reactions with salts of sodium, barium, calcium, magnesium, aluminum, and lead, but none of them gave even approximately complete recovery of the nicotine. The barium salt removed only 40 percent. Organic bases gave better results. β-Naphthylamine was partly satisfactory in that it seemed to leave little if any nicotine in the insoluble form, but owing to its volatility with steam it interfered with the subsequent silicotungstic acid precipitation. The alkaloid brucine, which neither volatilizes with steam nor interferes with the steam distillation, was then shown to provide a quantitative exchange reaction and was made the basis of the method here described.

Farm production of sorgo sirup, C. F. Walton, Jr., E. K. Ventre, and S. Byall (*U. S. Dept. Agr., Farmers' Bul. 1791 (1938), pp. II+40, figs. 14*).—Superseding Farmers' Bulletin 1389 (E. S. R., 51, p. 13), this publication describes recently developed improvements in the method of making sorgo sirup. Starting with the harvesting of the sorgo, it describes the manufacture of sorgo sirup by the methods recommended for practical use on the farm. It describes a lay-out for the plant and the equipment needed for efficient operation, and gives the cost of materials, equipment, and labor required to construct and operate a sirup-making outfit. It gives suggestions for avoiding many of the difficulties of sirup making, for making sirup on shares, for the use of the byproducts, and for more efficient marketing.

Manufacture of rum [trans. title], R. Arroyo (*Puerto Rico Col. Sta. Circ. 106 (1938), Span. ed., pp. 70*).—The author takes up systematically the various factors in the production of a rum of uniform and good quality.

AGRICULTURAL METEOROLOGY

Is the climate changing? S. A. Mitchell (*Commonwealth [Va. State Chamber Com.], 5 (1938), No. 2, pp. 15, 16, fig. 1*).—The author concludes in general that there is little evidence of a permanent change in the climate of Virginia, and that there has been little or no success up to the present time in using the sunspot period to predict coming weather even over so short a period as a month in advance. He quotes a Mount Wilson astronomer, who says: "That connections between solar phenomena and weather do exist can hardly be questioned, but until we know more about the other factors at work, predictions based on solar phenomena alone will be of little practical value."

Centers of action and long period weather changes, H. H. Clayton (*Bul. Amer. Met. Soc., 19 (1938), No. 1, pp. 27–29, figs. 2*).—This is a further elucidation of the author's well-known views on this subject.

Thunderstorm forecasting with the aid of isentropic charts, J. Namias (*Bul. Amer. Met. Soc., 19 (1938), No. 1, pp. 1–14, figs. 9*).—This is a preliminary report on a general research program carried on by the Massachusetts Institute of Technology, the principal purpose of which is to extend the methods and results of applied fluid mechanics to problems of atmospheric circulation,

especially the use of the tephigram for this purpose. The author finds that "the tephigram enables one to determine whether the convection initiated aloft is capable of reaching down into the moisture-rich lower layers. If the thermal structure of the atmosphere makes this possible, thunderstorms are probable. On the other hand, if the lower layers are too cold, the tephigram indicates that the convective energy aloft will be dissipated before it can receive supplies of moisture from the lower layers. In this case, even though the chief emission layer is at high levels, thunderstorms are not likely to occur."

The amount of dust in the air at plant height during wind storms at Goodwell, Oklahoma, in 1936–1937, W. H. LANGHAM, R. L. FOSTER, and H. A. DANIEL (*Jour. Amer. Soc. Agron., 30 (1938), No. 2, pp. 139–144, figs. 2*).—Measurements with an impinger tube to determine the amount of dust per cubic foot of air at various times during 29 dust storms in 1936 and 1937 at Goodwell showed the average amount of dust collected in all storms to be 33±14 mg per cubic foot of air. The average wind velocity during these storms was 23.2±2.5 miles per hour. The number of dusty days during the period from January 1, 1933, to August 1, 1937, varied from 22 in 1934 to 117 in 1937.

The variations in Kansas soil moisture, F. C. FENTON (*Northwest. Miller and Amer. Baker, 13 (1936), No. 4, p. 58, fig. 1*).—This is a very brief discussion of the large and frequent departures from mean annual rainfall in Kansas. In only 22 of the past 75 yr. has the rainfall for any one 3-yr. period been close to the mean for the total period.

***Hydrology of Virginia.*—I, *Annual rainfall and stream flow studies with* an introduction to statistical methods of analysis,** P. H. McGAUHEY (*Va. Engin. Expt. Sta. Bul. 33 (1938), pp. 113, pls. 4, figs. 6*).—This bulletin gives data regarding annual rainfall and stream flow in Virginia and reports studies of statistical methods of analysis of such data.

SOILS—FERTILIZERS

[**Soil Survey Reports, 1933 Series**] (*U. S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpts.], Ser. 1933, Nos. 11, pp. 45, pls. 2, figs. 2, map 1; 12, pp. 47, figs. 2, map 1; 15, pp. 41, pl. 1, figs. 2, map 1*).—These surveys were made in cooperation with the respective State experiment stations: Nos. 11, McIntosh County, Okla., E. W. Knobel and O. H. Brensing; 12, Oceana County, Mich., C. H. Wonser et al.; and 15, upper Gila Valley area, Ariz., E. N. Poulson and F. O. Young.

Criteria of the horizons of the soils in the Podzol zone, J. S. JOFFE (*Soil Sci. Soc. Amer. Proc., 1 (1936), pp. 329–332*).—In a contribution from the New Jersey Experiment Stations the author presents typical descriptions of A_0, A_1, A_2, B_1, and B_2 horizons of true Podzols, Gray-Brown Podzolic soils (soils in which the podzolization process is incomplete), and Podzolic Brown Earths (Braunerde). "The criteria described for the soils in the Podzol zone are for the standard types. Local variations, like microrelief, microclimate, influence of man control of forest species, drainage, etc., may modify somewhat the details, but the general features of the profile will remain."

A note on mechanical analysis and soils texture, T. M. SHAW and L. T. ALEXANDER. (U. S. D. A.). (*Soil Sci. Soc. Amer. Proc., 1 (1936), pp. 303, 304*).—This brief note calls attention to the possibility of improving agreement between laboratory determinations of the basis of actual particle size and the field observations of the soil surveyor by redefining clay as consisting of particles not more than 2μ in diameter. It is also recognized that "not only quantity but kind of colloid is effective in determining texture."

A soil auger for dry soils, R. C. Cole and J. L. Retzer. (Univ. Calif. coop. U. S. D. A.). (*Soil Sci. Soc. Amer. Proc., 1 (1936), pp. 305, 306, fig. 1*).—This instrument "consists of a 3.5-in. steel cylinder of thin-walled well casing 8 in. long to which are welded two triangular-shaped blades of high-grade tool steel, equally spaced on the bottom edge of the cylinder. The cutting edges of the blades are flared out slightly at the center so that the hole cut by the blades is a little larger than the outside diameter of the cylinder. The lower edge of each blade is curled inward slightly to hold the soil in the cylinder, and the tips of the blades are turned downward to make the auger dig in better. . . . A hardwood handle is connected to a piece of 0.5-in. pipe, which is, in turn, fastened to the cylinder with two steel strips welded to the pipe and to the inside wall of the cylinder. . . . Sixty in. is a convenient length for the entire auger."

Adaptation and use of automatically operated sand-culture equipment, H. D. Chapman and G. F. Liebig, Jr. (Calif. Expt. Sta.). (*Jour. Agr. Res. [U. S.], 56 (1938), No. 1, pp. 73–80, figs. 4*).—The authors describe two automatically operated sand-culture arrangements, the one designed for greenhouse use, the other for operation out of doors.

The nutrient solution is circulated by means of compressed air-operated ejector-type pumps. A clock-controlled magnetic valve in the air line provides for periodic and automatic pumping. This system has given satisfactory service over long periods with little attention other than that required for the maintenance of nutrient-solution concentration. Various experiences relative to iron supply and frequency of flushing are described, and examples of the results secured with this type of equipment are given.

Some results of differential feeding by corn root systems, V. E. Spencer (Nev. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc., 1 (1936), pp. 269, 270, fig. 1*).—The author devised a form of sand-culture experiment in which the root systems of corn plants, usually about 1 mo. old at the beginning of the experiment, were divided among three compartments in the pot, so that nitrogen, potassium, and phosphorus could be supplied entirely separately and independently to the three separate portions of the root system. Calcium, magnesium, iron, and sulfur compounds were supplied equally in all three compartments in all the experiments. The three principal nutrients were supplied either in the same concentration as in mixed feeding or in a tripled concentration so as to supply the plant, through one-third of its root system, with the same total quantity of each nutrient as would be supplied in an undivided pot.

"An outstanding unilateral injury occurred to the leaves of the plants fed differentially. Fairly early in the development of the plant, the half leaves (from midrib to edge) of the differentially fed plants turned light green, then yellow, then brown, and soon died. This effect was always more pronounced on the lower leaves of the plant, and gradually decreased with the height of the leaf on the stalk, and in most instances the top two or three leaves were not affected in this manner. This severe half-leaf injury, moreover, consistently appeared on the side of the leaf toward the nitrogen compartment, regardless of which side of the plant the leaf was on. In pointing out this relationship between the leaf injury and the nitrogen compartment, the author does not ascribe the injury especially to nitrogen. The relationship is mentioned merely for the purpose of orientation.

"These results show that when localization of the nutrients is carried to an extreme, as in the complete segregation of the various nutrients supplied to the plants differentially fed in these experiments the corn plant has difficulty in adapting itself to this condition, and not only is the total growth markedly reduced but severe localized injury is manifested in the top growth. Both these

detrimental effects appeared, in the case of the plants differentially fed, no matter whether the concentrations of the nutrients were the same in all compartments receiving them or whether the concentrations of the segregated nitrogen, phosphorus, and potassium were increased so as to supply those plants with the same total amount of each nutrient as was given to the normally fed plants. . . . While this extreme case of nutrient localization will not be found in the field, it seems probable that where the soil is deficient in a given nutrient, and that nutrient is supplied to a fraction of the root system only, the same adverse factors may be operative, although to a lesser extent."

Some field observations with tensiometers, L. A. RICHARDS (Iowa Expt. Sta.) and O. R. NEAL (U. S. D. A.) (*Soil Sci. Soc. Amer. Proc., 1 (1936), pp. 71–91, figs. 15*).—The authors discuss some details of the design and operating characteristics of soil moisture tensiometers and describe the construction and installation of both indicating and recording instruments.

According to their observations, "the comparatively rapid tension changes which were found indicate the moisture was present in the soil in a connected liquid phase up to within a few inches of the surface.

"In a uniform fallow plat of Marshall silt loam soil, quadruplet sets of tensiometers with cups at the 6-, 12-, 24-. and 36-in. depths were installed at three locations down the slope. The readings over the 48-day period indicate that at any given time the tension at the 6- and 12-in. depths was fairly uniform over the plat even when the tension at these depths was changing rapidly from one day to the next in response to rainfall or evaporation. Consistent differences occurred in the readings at the 24- and 36-in. depths which indicated that at these depths the water was held less securely by the soil toward the bottom of the slope. . . .

"Quadruplet tensiometer sets of similar design were also installed in a check plat and four adjacent fallow plats which for 5 yr. had been given organic matter treatments. Two of these plats received annually 8 and 16 tons per acre of manure, and the other two received light and heavy green sweetclover applications equivalent in dry matter content to the manure applications. The tensiometer data from these plats, taken as a whole, are fairly consistent in indicating that adding organic matter to the surface 7 in. of soil decreased the capillary tension at all depths where measurements were taken, the heavier organic matter additions causing the larger tension reductions. The tensiometer data indicate the moisture contents of the various plats ranged exactly in the order which would be expected from rainfall run-off data which have been available on these plats for several years.

"Charts from duplex recording tensiometers installed in fallow soil indicate that in dry weather large diurnal fluctuations occur in the capillary tension at the 6- and 12-in. depths. Between these depths the recorders showed that the average water moving field, the net force per unit mass of liquid water in the soil, was upward except for short periods after rain, and values as high as 16.5 times gravity in the upward direction were recorded."

Charts illustrate how multiple pen recording tensiometers give an automatic record of the time required for rain water to reach definite depths in a soil.

The value of added water data in testing fertilizer requirements of soil, J. E. CHAPMAN. (Cornell Univ.). (*Soil Sci. Soc. Amer. Proc., 1 (1936), pp. 259, 260*).—Experiments have shown considerable discrepancies between the moisture contents of pots maintained under supposedly uniform conditions. The author points out, however, that "the essential data for comparable moisture content of pots are not difficult to obtain.

"Each empty pot is weighed. The weight and moisture content of the soil of each pot is recorded. The weight of water to saturate a unit of soil is determined. From these data a chart is made on cross-section paper. The units of water lost and the percentage of water are the ordinates and abscissa, respectively. Thus, a straight-line graph is constructed. With this graph, the approximate moisture content of the soil is known whenever the pot is weighed. For example, at optimum moisture, pot A contained 34 percent moisture. When the pot lost 25 g water, the chart showed the moisture content of the soil in the pot to be 20 percent. It is well to remember, the plants themselves are growing daily, therefore exact moisture control necessitates correction for the actual weight of the growing plants. Hence the suggested moisture control is only approximate. Yet it will prevent wide soil moisture deviations within the pot test. If provision is made to correct for water loss by evaporation, such as fallow pots, the data of added water can be utilized as a check on fertility."

Linear changes in the Shelby loam profile as a function of soil moisture, C. M. Woodruff. (U. S. D. A.). (*Soil Sci. Soc. Amer. Proc., 1 (1936), pp. 65–70, figs. 5*).—The author found at Bethany, Mo., during a period of severe drought, a vertical shrinkage sufficient to affect markedly the elevation readings used in determinations of erosion rates. For one plat the average vertical shrinkage figure was 2.49 in. "Until the coefficient of contraction and expansion can be definitely determined for the various soil and crop conditions experienced, it will be necessary that all studies involving soil movement, as measured by elevation readings, be made at approximately the same soil moisture contents. . . .

"The problem also appears to be closely connected with the development of the loose aggregated soil condition that exists following the growth of soybeans and clovers. Under such conditions, the formation of the aggregate might be attributed to the rapid shrinkage of the soil with the formation of small cleavage planes or cracks at lines of weakness produced by the root systems that characterize these plants."

Some moisture relations of soils from the erosion experiment stations, L. B. Olmstead. (U. S. D. A.). (*Soil Sci. Soc. Amer. Proc., 1 (1936), pp. 61–64*).—The author presents and very briefly discusses the correlation coefficients of the soil moisture constants from data of the erosion station soils. The correlations of minimum water of saturation, normal moisture capacity, sticky point, moisture equivalent, lower plastic limit, centrifugal moisture, and water vapor absorption among themselves and with laboratory volume weight, settling volume, exchangeable bases (colloid), and silica: sesquioxide ratio (colloid) are tabulated.

The comparative moisture-absorbing and moisture-retaining capacities of peat and soil mixtures, I. C. Feustel and H. G. Byers. (U. S. D. A.). (*Soil Sci. Soc. Amer. Proc., 1 (1936), pp. 323–325*).—This investigation has shown that "the addition of peat to soil increased the wilting moisture content by an amount roughly proportional to the quantity of peat used and to the magnitude of unavailable moisture held by the peat as compared with that of the soil before mixing. Wilting percentages calculated from the moisture equivalent according to the Briggs and Shantz formula were found to be in fair qualitative agreement with the experimental data. Since moisture relationships alone were considered in this study, no conclusions can be made as to other physical transformations, beneficial or otherwise, that result from the incorporation of peat with soil. The use of peat as a soil amendment for the sole purpose of conserving a supply of available moisture, however, is not recommended, except possibly in the case of a decomposed type of peat with a sand or a very sandy soil."

Peat land in the service of flood control and water conservation, A. P. Dachnowski-Stokes. (U. S. D. A.). (*Soil Sci. Soc. Amer. Proc., 1 (1936),*

pp. 319–321).—In the opinion of the author, improper use and handling of peat land has been one of the major causes of loss from floods in certain areas. "The stripping of the vegetation cover and excessive burning and draining of areas of peat along the courses of valley streams, on lakes, ponds, and flat sandy plains or in shallow depressions of uplands have contributed to returning surface waters to the streams more quickly and destroying the balance of forces which it required ages for nature to develop." As a partial remedy for this phase of the flood-control problem, he considers that "all the areas of peat damaged beyond repair or unprofitable to crop production should be taken out of cultivation and restored to native vegetation units known to be highly effective in protecting and stabilizing peat land against further losses of water. Development of peat-forming vegetation and continued renewal of peat areas, maintenance of lakes and ponds, and creation of more extensive wildlife refuges will render flow and low-water control less difficult. Small demonstration projects could be operated on peat areas representing different geographic regions in order to determine definite basic facts and methods of procedure in the control and storage of water supplies. Unless science and practice work in closer cooperation to conserve the Nation's natural resources, both land and water in this country will ultimately reflect a more tragic story than that offered by the recent flood and drought conditions."

What is soil erosion? C. F. S. SHARPE (*U. S. Dept. Agr., Misc. Pub. 286* (*1938*), *pp.* [*4*]+*84*, *figs. 101*).—Soil erosion is described from the geological viewpoint as an accelerated phase of natural erosion.

Selected bibliography on erosion and silt movement, G. R. WILLIAMS ET AL. (*U. S. Geol. Survey, Water-Supply Paper 797* (*1937*), *pp. II+91*).—This bibliography was prepared in cooperation with the Works Progress Administration for New York City and the U. S. D. A. Soil Conservation Service.

Influence of drainage upon Coastal-Plain soils, R. S. HOLMES. (U. S. D. A.). (*Soil Sci. Soc. Amer. Proc., 1* (*1936*), *pp. 161–163*).—This study of a series of soils developed from the same parent material, under the same climatic conditions but with variable drainage, and ranging in pH from 5.1 in the best-drained to 4.1 in the poorest-drained soils, has shown that "the amount of eluviation increases with drainage, but the degree of leaching and debasing increases with the lack of drainage. The bases are low in the colloids of all the soils but are lowest in the poorly drained soils. The extent of variation in the major constituents of the soil colloids is indicated by the silica: sesquioxide ratio, which varies from 1.2 in the well-drained to 2.2 in the poorly drained soils. Other derived data, such as the ratios of silica to alumina, water to alumina, silica to total bases, and combined water, each aid in interpretation of the chemistry of the colloid."

The reclamation of alkali soils, W. P. KELLEY (*California Sta. Bul. 617* (*1937*), *pp. 40*, *figs. 15*).—The author found that salts accumulating in the surface soil by capillary rise and evaporation of soil water can only be dealt with by leaching and by keeping the water table below the root zone. Alkaline soils containing both soluble carbonate and absorbed sodium were effectively treated with sulfur at Fresno, 1,000 lb. per acre being sufficient. This was more economical than gypsum, iron sulfate, or alum. A still cheaper and equally effective reclamation was secured by encouraging the growth of Bermuda grass and irrigating frequently for two summers. The alkali conditions were effectively overcome. "It is probable that the growth of some alkali-resistant legume, such as *Melilotus alba*, under similar irrigation conditions, will be as effective and possibly more so. In climates not favorable for Bermuda grass,

it has been found that the growth of other grasses and legumes can be utilized to good advantage." The results "show definitely that it is economically feasible to reclaim almost any alkali soil provided it can be effectively drained and an adequate supply of irrigation water is available."

The occurrence and distribution of Azotobacter in Iowa soils, W. P. Martin and R. H. Walker. (Iowa Expt. Sta.). (*Soil Sci. Soc. Amer. Proc., 1 (1936), p. 215*).—This brief note indicates that in general *Azotobacter* is dependent upon the pH value (minimum about 6) and upon the phosphate content of the soil (minimum about 50 lb. per acre). Also a greater percentage of the samples taken from soils occurring in the more depressed areas contained *Azotobacter* than was the case with the samples taken from soils in other topographic positions.

"Many of the soil samples with a pH above 6.0 and an available phosphate content greater than 50 lb. per acre, however, contained no *Azotobacter*, which may indicate that factors other than pH and the content of available phosphate were limiting the growth of the *Azotobacter* in these soils."

The role of traces of molybdenum in the physiology and agrobiology of Azotobacter, D. Burk and C. K. Horner. (U. S. D. A.). (*Soil Sci. Soc. Amer. Proc., 1 (1936), pp. 213, 214*)—This very brief note on experiments shows that, "contrary to a long-established opinion, it is quite possible for *Azotobacter* to grow faster in nitrogen gas as a source of nitrogen than in probably most fixed nitrogen compounds except ammonia and possibly urea, providing adequate Mo is present. When Mo is partially deficient . . . many fixed nitrogen compounds may be superior sources of nitrogen for nutrition. According to our recent results, Mo has no influence on the growth of *Azotobacter* in fixed nitrogen, providing N_2 gas is not present. . . .

"These findings have an obvious bearing on the question of nitrogen fixation by *Azotobacter* in soils, especially in relation to their molybdenum content. . . . Examination of soils for *Azotobacter* should always involve additions of Mo, and other substances added and producing growth should be shown not to contain Mo or V. Much soil examination work for the presence of *Azotobacter* carried out in the past must probably be reinterpreted in the light of possible Mo deficiency on the one hand or Mo contamination on the other."

The origin, distribution, and effects of selenium, H. G. Byers. (U. S. D. A.). (*Soil Sci. Soc. Amer. Proc., 1 (1936), p. 327*).—This is a very brief summary of the history and present status of the seleniferous soil problem.

Hydrolysis of certain soil minerals, T. F. Buehrer and J. A. Williams. (Ariz. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc., 1 (1936), pp. 165–170, figs. 2*)—It has been shown that "the carbonate minerals undergo extensive hydrolysis to form highly alkaline solutions, the extent of the hydrolysis being a function of the mineral : water ratio. The maximum pH attained at the highest dilutions correlates closely with the known character of these compounds, both in synthetic and in the naturally occurring modifications. The pH curves for calcareous soils are very nearly identical with those of calcium carbonate, and we are, therefore, of the opinion that calcium carbonate-bicarbonate buffer system determines the pH of such soils. . . .

"When the aluminosilicates hydrolyze, the initial base-exchange reaction is apparently followed by a reaction involving the action of hydroxyl ions on either the original or the hydrolyzed mineral. Such a change Magistad [E. S. R., 60, p. 515] finds in sodium and potassium zeolites in which soluble alumina appears in the solution as sodium aluminate in an amount proportional to the pH of the solution at the start. It involves the process which Burgess [E. S. R., 62, p. 506] terms a 'break-down' of these zeolitic minerals,

in which relatively less alkaline compounds like silicic acid and aluminates appear in solution."

Electrodialysis and cation exchange studies on soils with varying organic matter content, A. L. PRINCE and S. J. TOTH. (N. J. Expt. Stas.). (*Soil Sci. Soc. Amer. Proc., 1 (1936), p. 193*).—The addition of organic matter and phosphorus increased the acidoid : basoid ratio of the soil complex and consequently lowered the ultimate pH and increased the cation-exchange capacity. "Thus, the plats receiving manure showed a decrease of approximately 0.4 to 0.6 pH unit and an increase in cation-exchange capacity of about 4 milligram equivalents per 100 g of soil. Mobilization of iron and silica increased with decreasing ultimate pH.

"Electrodialysis reduced the cation-exchange capacity of all samples, the greatest loss occurring on the plats receiving manure and lime. This was explained on the basis that during electrodialysis acidoids were hydrolyzed, and also that a certain fraction of the soil complexes mobilized and precipitated in the cathodic chamber. . . . It was found that after electrodialysis a pH gradient existed in the soil compartment varying from 4.3 near the anode to 5.0 at the cathode. An analysis of the sediment appearing in the cathodic dialyzates showed that the material was predominantly basic and had a low cation-exchange capacity. Organic matter and manganese were also found in the sediment, as well as appreciable quantities of calcium and magnesium."

Evidences of the significance of oxidation-reduction equilibrium in soil fertility problems, L. G. WILLIS. (N. C. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc., 1 (1936), pp. 291–297, figs. 2*).—Factors influencing the solubility of iron, copper-potassium relationship, the function of active silica, and copper effect on sandy soils are discussed with reference to a theoretically possible connection with soil oxidation-reduction reactions.

The chemical composition of soils and colloids of the Norfolk and related soil series, R. S. HOLMES, W. E. HEARN, and H. G. BYERS (*U. S. Dept. Agr., Tech. Bul. 594 (1938), pp. 34, pl. 1, fig. 1*).—Analytical data for profiles of eight soil series of the Atlantic Coastal Plain include mechanical and chemical analyses of the soils, determination of their pH values, and chemical analyses of their colloids. These soils have developed from the same parent material and under the same climatic conditions but with variable drainage. They are all acid, the acidity ranging from pH 5.1 in the best-drained to 3.8 in the poorest-drained soils. The extent of eluviation increases with drainage, but the degree of leaching and debasing increases with the lack of drainage. The monovalent and divalent bases, as well as manganese, are low in all the soils but are lowest in the poorly drained ones. The accumulation of organic matter under poor drainage conditions accompanies the depletion of bases.

The character of the colloids is indicated by derived data. The degree of variation of the major constituents in the soil colloids is expressed by the silica : sesquioxide ratios, which range from 1.2 in the well-drained soils to 2.4 in the poorly drained ones. The presence of decomposing organic matter under poor drainage conditions showed a tendency to deplete the iron content of the colloids. The ratio of iron to alumina ranges from 0.26 in the best-drained soils to as low as 0.04 in those with poor drainage. The combined water as compared to alumina was found to be essentially constant, ranging from 2.6 in the better-drained soils to 1.9 in the poorly drained ones.

It is concluded that the dominant differentiating role is played by differences in drainage and by the effects resulting from the drainage conditions. It is also concluded that the colloid of all the soils is dominated by the presence of a highly debased aluminosilicic acid of the halloysitic type ($3H_2O.Al_2O_3.2SiO_2$).

It is suggested that the marked absence of base ions is an important consideration in the utilization of these soils for agricultural purposes.

The significance of the weathering loss of K and Mg in soil colloids extracted from Illinois soils, R. H. Bray. (Ill. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc., 1 (1936), pp. 153–159*).—The soil clays of Illinois shale- and loess-derived soils, consisting of a mixture of clay minerals and end products of mineral decomposition, have been investigated with the result that "a critical analysis of the data presented, supported in part by X-ray and petrographic data, indicates that (1) illite, formula A $[(NH_4)_2O.MgO.(Al_2O_3)_{4\frac{1}{2}}.(Fe_2O_3)_{1\frac{1}{2}}.(SiO_2)_{18}.(H_2O)_{11-15}]$, and formula B $[(NH_4)_2O.(Al_2O_3)_{4\frac{1}{2}}.(Fe_2O_3)_{1\frac{1}{2}}.(SiO_2)_{18}.(H_2O)_{23-30}]$ represent the bulk of the clay minerals present in these clays; (2) quartz and perhaps a base-free mineral possessing no exchange properties occur mainly in the coarse colloid; and (3) a low $SiO_2:R_2O_3$ ratio residue occurs in the most weathered superfine and fine colloids."

Availability of essential soil elements—a relative matter, E. Truog. (Wis. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc., 1 (1936), pp. 135–142*).—The author points out that "the degree of availability of any one of the essential plant nutrients of the soil usually varies over a considerable range, depending on the form or forms in which it exists and the condition of the soil, especially as regards reaction and presence of excessive amounts of calcium carbonate. Phosphorus, for example, exists principally as calcium phosphate and basic iron phosphate. The former dissolves easily in weak acids and may be classed as readily available to plants, excepting when the soil contains an excessive amount of calcium carbonate (2 percent or more). The latter form dissolves much more slowly in weak acids and is for the most part difficultly or slowly available. If, however, this latter form exists in large amounts, the rate of solution of phosphate from it may be rapid enough to supply the needs of a crop. . . . The degree of availability or sufficiency of any particular element also varies with the climate, supply of other nutrients, and the kind of crop grown. Availability of the plant nutrients in the soil is, therefore, a relative matter. For both practical and scientific purposes, it is highly desirable to distinguish between the more readily available and less readily available portions of phosphorus and other nutrients of soils. The use of the terms 'available' and 'unavailable' in speaking of these two portions is not conducive to clear thinking and leads to confusion. . . . The use of terms like 'readily available' and 'difficultly available,' in this connection, expresses the situation much more correctly and satisfactorily and is a great help in any consideration of the subject."

Availability of plant nutrients, P. L. Hibbard. (Univ. Calif.). (*Soil Sci. Soc. Amer. Proc., 1 (1936), pp. 149–151*).—The author briefly discusses factors affecting the rate at which substances not easily soluble in water become available to the plant. Among these factors are physical, chemical, and biological conditions in the soil; the nature of the plant with respect to need for specific nutrients, its length of growing season, and its ability to forage for itself; and the character of the climate with respect to light, temperature, moisture, and the length of the growing season.

Some limiting factors in estimating the fertilizer requirements of a soil, W. T. McGeorge and J. F. Breazeale. (Ariz. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc., 1 (1936), pp. 131–134, fig. 1*).—Puddling, which interferes with the growth of test plants by depriving them of moisture supply, by limiting or preventing normal nitrogen transformations, and in other ways, constituted one of the main difficulties encountered in estimating the fertilizer requirements of soils. A high content (from 2 to 10 percent) of calcium carbonate also had to be taken into consideration.

Fertilized check plots, J. E. Metzger. (Md. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc., 1 (1936), pp. 261–264, fig. 1*).—"In general, the evidence seems to warrant the conclusion that fertilized check plats do measure the yield response of variously treated test plats more accurately than 'untreated' plats. There is no doubt that the advantages gained through greater interest in the work by the producers has much to commend the system, and further a combination of treated plats and replicated plats seems to have possibilities for measuring variables in fertility plat work to a greater degree than either system if used exclusively."

The availability of the essential nutritive elements as affected by soil types, O. C. Bryan. (Univ. Fla.). (*Soil Sci. Soc. Amer. Proc., 1 (1936), pp. 121–123*).—According to this brief note "it is only logical to correlate availability studies on the basis of soil groups, such as Podzols, Chernozems, Prairie soils, Laterites, etc. The factors that affect availability in each of these soil groups are different, although blends may be recognized."

Chemical analyses as an aid in the control of nitrogen fertilization, Q. H. Yuen and R. J. Borden (*Hawaii. Planters' Rec. [Hawaii. Sugar Planters' Sta.], 41 (1937), No. 4, pp. 353–383, figs. 15*).—The authors report the use of rapid chemical methods for following soil nitrogen contents in cropped and uncropped potted soils. The paper is preceded by a foreword by F. E. Hance.

In general, the available nitrogen of the uncropped soil increased during fall and winter and dropped off during late spring and summer. When sugarcane was growing in the soils studied the available nitrogen supply was usually low. "The cane plant can rapidly remove from the soil the available nitrogen which was either originally present or is later applied. The rate of absorption appears to depend upon the time of application with respect to the age of the plant or probably with the development of its root system and is apparently independent of the needs of the plant. Nitrogen absorbed beyond the requirements of the moment may be stored up and used for later growth. Thus it is possible for the cane plant to absorb nitrogen from one application at an early stage of its life and without further uptake continue to grow for a period which is probably dependent upon the quantity which had been absorbed. The timing of the nitrogen application may be an important factor in the growth of cane. The efficiency of split v. single applications is in a measure dependent upon the time of application of the successive split portions."

A study of the availability of phosphorus and potash and their influence upon vegetable crop production and fertilizer practices on Coastal Plain soils, J. B. Hester, R. L. Carolus, and J. M. Blume. (Va. Truck Expt. Sta.). (*Soil Sci. Soc. Amer. Proc., 1 (1936), pp. 233–242, figs. 2*).—The authors studied the availability in sand cultures of various phosphates likely to occur in soils. They compared also the determined available potassium content of certain soils with the potassium absorption and yield of various crops.

The relationship between water-soluble, replaceable, and fixed fractions of potash additions to soils, W. M. Shaw and W. H. MacIntire (*Soil Sci. Soc. Amer. Proc., 1 (1936), pp. 143–148, figs. 6*).—Accelerated absorption of potassium was introduced by four successive evaporations of constant charges of a red clay acid subsoil and a calcareous black clay loam with various quantities of potassium sulfate at the Tennessee Experiment Station. The fixation was then determined by aqueous and ammonium acetate extractions. It was found that the absorptions increased with increased additions, but the highest rates of absorption were registered by the minimal additions. The calcareous soil absorbed more potash and held it more tenaciously than did the acid subsoil.

"Practically complete recoveries of 100- and 500-mg K_2O additions were recovered from the red clay subsoil, leaving none in the 'fixed' state, as the total

effect of four aqueous extractions and four supplemental ammonium acetate extractions. The same technic registered extension fixations, or nonexchangeable fractions, of the much greater absorptions that were effected by the calcareous soil."

Relative effect of different superphosphates on the preservation of nitrogen in cow manure, A. R. Midgley. (Vt. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc., 1 (1936), pp. 299–301*).—The investigation here summarized has shown that neither monocalcium phosphate nor calcium sulfate acting alone has much capacity for the conservation of volatile ammonia, but the two acting together are very effective for this purpose. The ammonia is converted into a stable salt, ammonium sulfate, while the calcium of the gypsum so decomposed is taken up by the phosphate, which becomes tricalcium phosphate. "Approximately half of the total nitrogen in fresh cow manure is quickly converted to ammonia and may be lost by volatilization if subjected to drying conditions. Superphosphate helps to reduce this loss, usually in proportion to its gypsum content. . . . The 20 percent granulated superphosphate, containing the highest gypsum content, was somewhat superior to the other phosphates used. To be most effective, the phosphate should be intimately mixed with the manure in the stable gutter, if possible, and before rather than after fermentation."

Soil reactions at various depths as influenced by time since application, placement, and amount of limestone, B. A. Brown and R. I. Munsell. ([Conn.] Storrs Expt. Sta.). (*Soil Sci. Soc. Amer. Proc., 1 (1936), pp. 271–275*).—This investigation has shown that limestone, either mixed with the plow layer or added to the surface of soils, has reduced appreciably the acidity of lower horizons. The reduction by surface applications appeared to have been due to continuing disintegration and solubility of the limestone and not to a movement of exchangeable bases to lower levels at the expense of the upper. The soil tests and the increase in yields of grassland showed that surface application is a very efficient method of adding limestone to permanent turfs. It is estimated that about 300 lb. of limestone per acre annually will maintain a given pH in the plow layer of similar soils not receiving physiologically acid fertilizers. The depth, as well as the degree, to which acidity was reduced in the lower levels of soil were influenced by the quantity of limestone and by the lapse of time since its application.

Analyses of commercial fertilizers, fertilizer supplies, and home mixtures for 1937, C. S. Cathcart (*New Jersey Stas. Bul. 637 (1937), pp. 35*).—The first, and larger, part of the annual fertilizer analysis work in New Jersey for the 1937 season is here reported without comment.

Analyses of commercial fertilizers and ground bone; analyses of agricultural lime, 1937, C. S. Cathcart (*New Jersey Stas. Bul. 640 (1938), pp. 15*).—In addition to a report of the analyses of the 1937 season not already recorded in Bulletin 637, above noted, and a discussion of the entire inspection, the present bulletin contains a tabular summary of tonnages sold in New Jersey for the years 1927–37, a brief note on accuracy in securing representative samples, figures showing the average composition of the fertilizers sold in the years 1928–37, notes on calculation of commercial valuation, and related information.

AGRICULTURAL BOTANY

Photosynthesis, R. Emerson (In *Annual Review of Biochemistry, VI*, edited by J. M. Luck. *Stanford University, Calif.: Stanford Univ. Press, 1937, vol. 6, pp. 535–556*).—This critical review (with 93 literature references) of recent advances in our knowledge of photosynthesis takes up the inconstancy of the

process under natural conditions, its chemical and kinetic mechanisms, the quantum efficiency of photosynthesis, the question of photochemical action on the part of the carotenoids, the CO_2 factor and solarization, and various miscellaneous papers on the general subject.

Photoperiodic stimulus transfer in plants, W. F. Loehwing (*Science, 87 (1938), No. 2248, pp. 92, 93*).—To determine the perceptive locus and mode of transfer of phototropic stimuli the author has successfully used a thin, opaque panel with adjustable, horizontal slit through which the tops of potted plants are trained from both sides as they grow under a vegetative photoperiod. At any desired time, short-day lighting is started on one side and long-day on the other, thereby keeping the bases of one set vegetative and inducing flowering of the tops of the same plants, while the reciprocal responses are at the same time induced in the other set on the opposite side of the panel.

In experiments with dioecious plants, it was found that the functional and structural responses of staminate parts differ distinctly from those of pistillate parts to a given photoperiod, when the top and base of the same plant are subjected to contrasted day length.

Plant growth in relation to wave-length balance, E. S. Johnston (*Smithsn. Misc. Collect., 97 (1938), No. 2, pp. 18, pls. 4*).—"Emphasis is placed on the importance of quality or wavelength distribution of light in affecting plant growth. A method and several experiments are described in which plants were grown in 'mixed' lights. By placing the plants on small rotating tables between two light sources, one rich in red, the other rich in blue, the proportion of each type of radiation falling on each culture was varied by the position of the culture with reference to the light sources. As found in previous experiments, yellowing of leaves occurred in light rich in near infrared. Since this trouble could be corrected to a considerable extent by the type of nutrient solution used, it indicates the importance of wavelength distribution on the uptake of mineral nutrients.

"Excellent growth under entirely artificial conditions was obtained with plants grown between a 1,000-w, water-jacketed, projection Mazda lamp and a 400-w, high-pressure mercury lamp. The positions of the plants for good growth were such that from 14 to 51 percent of the total radiation falling on them came from the mercury lamp. In several cases better growth was attained in one mixture of wavelengths than in another where the total intensity was higher. However, the relatively high growth efficiency may in part be due to an intermittency effect occurring in gaseous discharge tubes such as the mercury lamp here used."

Development of carotenoid pigments without the aid of light, W. A. Beck (*Plant Physiol., 12 (1937), No. 3, pp. 885, 886*).—The results reported led to the conclusion that the origin and function of carotene and xanthophyll are probably related and that the material stored in the seed is probably the source of the necessary material and energy required for the formation of the carotenoid pigments. Carotene appears to have a stimulating action on root production, which suggests that it may be a precursor of auxin.

Photoperiodic stimulation of growth by artificial light as a cause of winter killing, P. J. Kramer (*Plant Physiol., 12 (1937), No. 3, pp. 881–883, fig. 1*).—The results of experiments with *Abelia grandiflora* are believed to indicate clearly that winter-killing resulted from failure to cease growth and become hardened before freezing weather. Furthermore, this failure to cease growth was definitely attributed to photoperiodic stimulation by electric light, thus indicating that *Abelia* should not be planted too near bright lights. The same conclusions are applied to black locust. It is believed that many cases

of winter-killing of isolated trees and shrubs result from proximity to electric lights, causing growth to continue too late in the fall.

Blossom bud development and winter hardiness, R. H. ROBERTS. (Univ. Wis.). (*Amer. Jour. Bot., 24 (1937), No. 10, pp. 683–685, figs. 64*).—Except for *Ulmus americana*, the degree of blossom-bud development (including gross development and cell maturity) of 61 species of trees and shrubs at the beginning of winter was found to be correlated with winter hardiness, the more advanced blossoms being more susceptible to cold injury.

Value of the dye-adsorption test for predetermining the degree of hardiness, S. DUNN. (N. H. Expt. Sta.). (*Plant Physiol., 12 (1937), No. 3, pp. 869–874*).—This test involving colorimetric measurement of colloid content of plant tissues had previously shown some promise as a measure of cold hardiness (E. S. R., 69, p. 365). Further work is here reported to determine its accuracy in predicting hardiness. Tests on individual plants (or even leaves) of *Bryophyllum* and cabbage gave contradictory results as compared to subsequent freezing effects on the same plants and leaves, and indicated the reliability of this test for hardiness to be doubtful. The conclusion is similar to that reached for most other methods for testing hardiness reported in the literature, but a somewhat limited effectiveness is indicated for testing the average hardiness of a large group of plants.

Vapor pressure gradients, water distribution in fruits, and so-called infra-red injury, O. F. CURTIS. (Cornell Univ.). (*Amer. Jour. Bot., 24 (1937), No. 10, pp. 705–710*).—The data presented demonstrate that the setting up of a steep temperature gradient across an apple results in a marked distillation of water from the warm to the cool side. The warm side then withers and develops symptoms previously ascribed to direct radiation injury. Withering was induced within 2–5 days by a temperature difference between the sides of 5°–10° C., which can be brought about by irradiating one side with visible or infrared rays or by exposing the two sides to different air temperatures. The evidence discussed indicates that water movement is probably restricted to movement in vapor form, since a steep temperature gradient has an insignificant effect on osmotic movement of water. A redistribution of water due to temperature differences in massive tissues is believed likely, therefore, to be restricted to tissues having connecting intercellular spaces.

The effect of high hydrostatic pressures upon seed germination, R. RIVERA, H. W. POPP, and R. B. DOW. (Pa. Expt. Sta.). (*Amer. Jour. Bot., 24 (1937), No. 8, pp. 508–513*).—In this study high hydrostatic pressures (20–4,000 atmospheres) in general proved very effective in hastening the germination of seeds of various plant species having hard, impermeable seed coats. Insofar as the present tests indicate, they were ineffective with seeds having persistently dormant embryos.

Permeability, R. COLLANDER (In *Annual Review of Biochemistry, VI*, edited by J. M. LUCK. *Stanford University, Calif.: Stanford Univ. Press, 1937, vol. 6, pp. 1–18*).—This literature review (with 66 references) covers the greater part of the years 1935 and 1936 and deals mainly with the protoplasmic permeability of plant and animal cells. The specific discussions take up methods, permeability to nonelectrolytes and electrolytes, permeability changes, model studies, the composition and structure of the plasma membrane, and permeability in relation to the active transport of matter.

Proof of the flux equilibrium relation, G. MARSH (*Plant Physiol., 12 (1937), No. 3, pp. 861–867, figs. 3*).—As the environal oxygen pressure of the onion root tip increased, its inherent e. m. f. increased, passed through a maximum, and then decreased. The effect proved to be reversible, i. e., the maximum occurs

with both increasing and decreasing oxygen pressure. Neither pressure, as such, nor altered vapor tension was responsible for the effect, since the e. m. f. was constant under different nitrogen pressures. "The existence of the maximum fulfills a specific prediction of the equations for the kinetics of an oxidation-reduction system for respiration and e. m. f. at flux equilibrium."

Daily periodicity of stomata in certain species of turf grasses, J. C. CARROLL and F. A. WELTON. (Ohio Expt. Sta.). (*Bot. Gaz., 99 (1937), No. 2, pp. 420–423*).—This study of the number, size, and periodicity of the stomata of *Poa pratensis, P. trivialis, Agrostis alba, A. tenuis,* and *Festuca rubra fallax* demonstrated a definite periodicity, the stomata of all five species being open during the day and closed at night. However, the species showed considerable differences in the percentage open at the same period, as well as in their size. The fescue had fewer stomata per unit area than the other species.

Cytological observations on colchicine, B. R. NEBEL. (N. Y. State Expt. Sta.). (*Biol. Bul., 73 (1937), No. 2, pp. 351, 352*).—This is an abstract of a contribution on the action of the alkaloid colchicine on mitosis in 11 plant and 3 animal genera.

Embryo-sac development in Yucca rupicola, G. M. WATKINS. (Tex. Expt. Sta.). (*Amer. Jour. Bot., 24 (1937), No. 8, pp. 481–484, figs. 21*).

Growth of the first internode of the epicotyl in maize seedlings, F. D. INGE and W. E. LOOMIS. (Iowa State Col.). (*Amer. Jour. Bot., 24 (1937), No. 8, pp. 542–547, figs. 6*).—In this study elongation of the first internode of the epicotyl of germinating maize was inhibited by exposing the coleoptile tips to light (particularly ultraviolet), decapitating the coleoptiles three times at 8-hr. intervals, or by heating the emerging coleoptiles at 50° C. for 1 hr. When heteroauxin paste was applied at the time of illuminating seedlings, the inhibiting effect of light on internode elongation was largely eliminated. During the normal rapid internode elongation period, the plumule and nodal root development was inhibited, but treatments (particularly illumination of the coleoptiles) which checked internode growth stimulated plumule and root growth, and after 24 hr. the shift became irreversible.

The results may be explained by assuming that internode elongation depends on a constant supply of auxin from the coleoptile tip. This same auxin supply inhibits plumule and nodal root growth. When the auxin supply is temporarily reduced, plumule development begins and the first internode of the epicotyl loses its capacity for further elongation.

Growth and structure of cotton fiber, D. B. ANDERSON and T. KERR. (Coop. U. S. D. A. and N. C. Expt. Sta.). (*Indus. and Engin. Chem., 30 (1938), No. 1, pp. 48–54, figs. 9*).—This presents a general, illustrated outline of the subject.

The floral development of the staminate flower of the Honey Rock muskmelon, J. E. JUDSON (*W. Va. Univ. Bul., 35. ser., No. 15 (1935), pp. 93–98, figs. 6*).—According to the results of this study of the staminate flower "the sepal lobes appear first, the petal lobes next, followed closely by the stamen lobes and finally the pistillodium lobes. The perianth tube is formed by the growth of the whole zone at the base of the sepal and petal lobes. There is no evidence of a so-called calyx tube fusing with a corolla tube. The tissues of the perianth tube fail to become differentiated into separate structures at their bases, resulting in the formation of a single tube."

Assimilation of ammonium and nitrate nitrogen from solution cultures by roots of Pandanus veitchii Hort., and distribution of the various nitrogen fractions and sugars in the stele and cortex, C. P. SIDERIS, B. H. KRAUSS, and H. Y. YOUNG. ([Hawaiian] Pineapple Producers' Expt. Sta.). (*Plant Physiol., 12 (1937), No. 4, pp. 899–928, figs. 8*).—The first of a series of studies

in which analyses were made of the exudate and of the stele and cortex of different fractions of the excised roots of *P. veitchii* grown in ammonium, nitrate, and minus-nitrogen solutions, respectively. Ammonium was assimilated instantaneously and at a high rate as it entered the root, where it was converted into amide or amino nitrogen or more gradually into protein. Nitrate was not assimilated so rapidly, and the amounts of the soluble-nitrogen fractions were not so high in the roots. The amounts of insoluble nitrogen were greater for nitrate than for ammonium solutions, the tentative explanation being that roots grown in the ammonium cultures, through the rapid formation of amino acids, utilize and exhaust very rapidly the carbohydrates and possibly other substances essential to protein synthesis. The newly synthesized organic nitrogen in the roots is transported through the stele to the proximal regions of the roots, following the path of water and mineral-salt conduction, and the channels followed by the hydrolytic products of stored nitrogen are believed to be the same. No appreciable amounts of protein were found in root exudates, indicating that assimilated nitrogen is translocated as soluble organic nitrogen. The data indicate that sucrose occurs in large amounts in the stele but is lacking almost entirely in the cortex, and suggest that reducing sugars possibly enter the stele through the terminal tissues of the main-root cortex. At different root levels there is in the stele an indirect relationship between the amounts of reducing sugars and sucrose. Apparently there is along the root a successive and rapid conversion of reducing sugars to sucrose.

The results obtained suggest that reducing sugars are the sugars of downward transport and that sucrose is stored in the stele. If sucrose ever enters the transport stream in the roots of *P. veitchii* it may follow a course like that in the sugar beet, viz, in an upward direction. The stele tissues of the roots of *P. veitchii*, because of their ability to synthesize and store sucrose, are considered comparable to the root tissues of sugar beets, as discussed by Colin (E. S. R., 38, p. 26). The bibliography contains 81 references.

A comparison of Chilean and purified nitrates on plant growth in sand and solution cultures, A. M. Baisden and A. L. Sommer. (Ala. Polytech. Inst.). (*West. Irrig., 18 (1936), No. 7, pp. 8, 9, figs. 4*).—When cotton and corn were grown in solution cultures of purified potassium phosphate, magnesium, calcium, and ferrous sulfates, and sodium nitrate v. identical solutions in which Chilean nitrate was substituted for the purified salt, the plants in the first solution soon became abnormal. Similar, though less pronounced, results followed with sand cultures. When the abnormal plants grown 7–10 days in the purified salt solutions were transferred to like solutions with the substituted Chilean nitrate they soon recovered and continued to make good growth. The better results with the commercial nitrate are believed to be due to "impurities" supplying elements needed by the plants in minute amounts.

Nitrogen metabolism of soybeans in relation to the symbiotic nitrogen fixation process, F. S. Orcutt. (Univ. Wis.). (*Soil Sci., 44 (1937), No. 3, pp. 203–215, figs. 5*).—In continuation of related studies (E. S. R., 73, p. 777), the soluble nitrogen fractions of soybean plants fixing free nitrogen were compared with those of plants supplied with combined nitrogen. The results indicated no evidence for the existence of the previously suggested intermediates in the fixation (or transport) of elemental nitrogen in legumes, viz, NH_3, NH_2OH, and amide, but it is pointed out that negative evidence by the methods used does not constitute disproof of any particular hypothesis. The only fraction apparently offering possible significance for the fixation process on the basis of this study is that group of nitrogen compounds contained in the basic nonamino fraction.

Starch formation in the leucoplasts of Phaseolus vulgaris, P. YOUNG (*Bul. Torrey Bot. Club, 65 (1938), No. 1, pp. 1–8, pl. 1*).—The young starch grains were found to originate in vacuole-like central areas of the young leucoplasts, and surrounding the growing grains there were persistent zones with color reactions similar to the vacuole-like areas. New starch layers were formed at the outer extremity of the last formed old starch grain, and they grew outward.

Organic acids of plants, T. A. BENNET-CLARK (In *Annual Review of Biochemistry, VI*, edited by J. M. LUCK. *Stanford University, Calif.: Stanford Univ. Press, 1937, vol. 6, pp. 579–594*).—This review of recent literature (with 60 references) deals with the metabolism of oxalic and lactic acids and with acids of the malic group.

Intensity of removal of cations from cotton, corn, and soy bean tissue by fractional electrodialysis, H. P. COOPER, W. R. PADEN, and R. L. SMITH (*Plant Physiol., 12 (1937), No. 4, pp. 979–987, fig. 1*).—The data obtained clearly illustrate the differential in the intensity of removal of metals from plant tissue, the strongest ions being most readily removed. Large proportions of the strong potassium and sodium ions were noted in the first fractions of the diffusate. Studies by this method on the intensity of removal of metallic ions from soils v. plant tissues are said to agree fully. A definite relationship exists between the intensity of removal of nutrients from the soil and that of their absorption by plants. It is therefore deemed logical to expect a definite relationship between the strength of the ions used by plants, the amount of light necessary for their optimum growth, and the food value or quality of energy supplied by certain organic compounds. The data compiled suggest that a relationship exists between certain common oxidation reductions and the free-energy decrease in the formation of certain nutrient salts, and also between the energy required for reduction of certain nutrient anions (e. g., nitrates, borates, carbonates, and phosphates) and the quality of the light necessary for optimum assimilation of the various nutrient materials by plants.

The dissimilation of phosphate esters by the propionic acid bacteria, C. H. WERKMAN, R. W. STONE, and H. G. WOOD. (Iowa State Col.). (*Enzymologia, 4 (1937), No. 2, pp. 24–30*).—Experiments are reported with proliferating cells of *Propionibacterium pentosaceum*. Glucose was preferred as a substrate to phosphoglyceric acid, hexosediphosphate, or α-glycerophosphate, but these esters were readily dissimilated and served as sources of growth energy. The organism grows in 0.02 M sodium fluoride in the presence of yeast extract and ferments glucose to normal products. The dissimilation of phosphoglyceric acid and α-glycerophosphate was almost completely blocked in 0.02 M fluoride, while hexosediphosphate was strongly inhibited. The possible mechanism of glucose dissimilation is suggested.

Mineral nutrition of plants, F. G. GREGORY (In *Annual Review of Biochemistry, VI*, edited by J. M. LUCK. *Stanford University, Calif.: Stanford Univ. Press, 1937, vol. 6, pp. 557–578, figs. 4*).—This review (with 58 literature references) summarizes the work of the author and his co-workers on the mineral nutrition of barley, and discusses recent pertinent literature dealing with the relation of growth to concentration of nutrients, balance of nutrients, differential varietal response, symptoms of deficiency, water relations, nitrogen and carbohydrate metabolism, the effect of nutrient deficiency on respiration and on carbon assimilation, and related data on mineral nutrition.

Distribution and movement of potassium nitrate in sand cultures, as related to irrigation and to porosity of container wall, A. A. DUNLAP (Conn. [New Haven] Expt. Sta.) and B. E. LIVINGSTON (*Amer. Jour. Bot., 24 (1937), No. 8, pp. 500–503, fig. 1*).—Both waterproofed and porous 7-in. pots were used,

nearly filled with sand to which was added 1 gm. of KNO_3 in a 0.1 M solution. Some pots were sown with tomato or cabbage seed, while others were without plants. Three methods of irrigation were used, viz, frequent watering in the usual manner, automatic subirrigation by rigid wicks with the water level about 10 cm beneath the level of the pot bottom, and automatic subirrigation by constant-level trays with the pots standing in water about 1 cm deep. By far the most vigorous plants grew in the waterproofed pots. Changes in the concentration of K and NO_3 in the sand masses were followed by colorimetric tests. With tray irrigation K and NO_3 apparently moved together, their concentration changes at various depths being due not only to root absorption but also to evaporation from the free sand surface and (when porous pots were used) from the pot walls. Surface water tended to offset evaporational upward movement of the salt.

Further evidence for the upward transport of minerals through the phloem of stems, F. G. Gustafson and M. Darken (*Amer. Jour. Bot.*, *24* (*1937*), *No. 9*, *pp. 615–621*, *fig. 1*).—The data presented are believed to prove beyond doubt, by electroscopic study of tissues following root absorption of radioactive potassium acid (?) phosphate prepared by use of the cyclotron, that phosphorus is conducted upward in the inner bark of willow, geranium, *Sedum praealtum*, and *Bryophyllum calycinum*, and if this is the case for phosphorus there appears to be no reason why other minerals are not also conducted in the phloem. The experiments likewise showed that phosphorus and presumably other elements are also conducted in the xylem, and the authors are convinced that both conducting tissues function in the upward transport of minerals.

Adsorption of mineral nutrients by sugar cane at successive stages of growth, A. Ayres (*Hawaii. Planters' Rec.* [*Hawaii. Sugar Planters' Sta.*], *41* (*1937*), *No. 4*, *pp. 335–351*, *figs. 10*).—It was found by this study that the percentage composition of the leaves and stalk are markedly influenced by the age of the cane plant, particularly during the early months of growth. The dry matter of the dead leaves contained much lower concentrations of K and N, and somewhat lower percentages of P, than that of green leaves, which is accounted for on the basis that these nutrients migrate back into the stalk before the leaves become physiologically inactive. The cane plant absorbed the principal mineral nutrients in widely different amounts, K and Si being taken up to the greatest extent, while N and P were absorbed in relatively moderate amounts. Of the nutrients studied, the absorption of Ca and Mg was lowest. The rates at which several mineral nutrients were absorbed varied with the age of the plant, but not always in the same degree for each nutrient. Except for Si, the absorption rates reached their maxima at the early age of 3 mo., during which time about 10 percent of the first year's uptake of P and K and nearly 25 percent of that of N occurred. After 6 mo. for N and about 10 mo. for Ca, Mg, and K the absorption rates diminished. On the other hand, the uptake of Si and P continued at essentially constant rates up to 14 mo., the end of the experiment. The absorption rates of K and N decreased immediately after acquirement of the maximum amounts of these nutrients by the green leaves.

It is deemed apparent that absorption of N and P, and in less marked degree that of certain other nutrients, by sugarcane is not primarily a function of the growth rate, but rather of the age or developmental stage of the plant. Pronounced differences occurred in the distribution of the elements among the components of the crop, being most marked for P and Si. The amounts of these nutrients in the stalk at harvest were 60 and 15 percent, respectively, of the totals taken up. Periodic examination of the amounts of the several nutrients

contained in given segments of the stalk indicated that as the younger tissues matured they lost K and N through upward migration.

Change in mineral composition of the tomato plant irradiated with a quartz-mercury vapor lamp and its relation to the level and ratio of calcium and phosphorus in the nutritive medium, W. D. Stewart and J. M. Arthur (*Contrib. Boyce Thompson Inst., 9 (1937), No. 2, pp. 105–120, fig. 1*).—Plants grown outside, in the greenhouse, and under shading cloth in fractional solution cultures were alternated (24-hr. intervals) between the McMurtrey "complete minus phosphorus or calcium" solutions (E. S. R., 69, p. 362) and single salt solutions containing calcium or phosphorus or both, the rate of supply and ratio of the two elements being varied. The plants were grown for 4–6 weeks in these solutions and their responses to irradiation under a quartz-mercury vapor lamp noted as reflected by changes in ash, phosphorus, and calcium.

Lacking calcium or phosphorus, the plants showed no increase in these respects on irradiation. The level supply of calcium or phosphorus rather than their ratio determined the presence or absence of response to irradiation. Without altering the Ca : P ratio (high ratios), presence or absence of response was secured by controlling the rate of solution renewal. Plants from solutions deficient in phosphorus (low renewal rate) were high in ash, and increase in phosphorus concentration of the solution lowered the ash content. Decreasing the light intensity during summer increased the dry weight, ash, and phosphorus content, but decreased the calcium. In phosphorus-deficient solutions (high Ca : P ratio) the response to irradiation was increase in ash and calcium, whereas in calcium-deficient solutions (high P : Ca ratio) the response was increase in ash and phosphorus. With intermediate values for phosphorus : calcium ratios the response was increase in ash, calcium, and phosphorus. A reciprocal relationship was observed between calcium and phosphorus. Phosphoric acid at 1 p. p. m. proved to be an excellent phosphorus source for tomato.

Activity of the potassium salt of indole-3-acetic acid in the Avena test, D. M. Bonner (*Bot. Gaz., 99 (1937), No. 2, pp. 408–411*).—The three substances indole-3-acetic acid, potassium indole-3-acetate, and sodium indole-3-acetate were found, as theoretically to be expected, to possess similar activities when their equimolar solutions, buffered at the same pH, were given the *Avena* test. It is suggested that with unbuffered solutions the difference in activity may be due to a pH effect.

Rubidium and strontium toxicity to plants inhibited by potassium and calcium respectively, A. M. Hurd-Karrer (*Jour. Wash. Acad. Sci., 27 (1937), No. 8, pp. 351–353*).—As a result of this study the author states that "insofar as the establishment of predicted relations by actual experiment constitutes evidence, the observed antagonism of arsenic, rubidium, and strontium by phosphorus, potassium, and calcium, respectively, substantiates the generalization suggested by the selenium-sulfur antagonism [E. S. R., 72, p. 203]. Briefly stated, this hypothesis is that in proportion to its relative concentration an essential nutritive element reduces the absorption and consequent toxicity of a toxic element sufficiently similar chemically to preclude selectivity on the part of the plant."

Effects of potassium deficiency on the formation of starch in Pisum sativum, D. Day and S. Comboni (*Amer. Jour. Bot., 24 (1937), No. 9, pp. 594–597*).—The potassium-starved plants showed necrosis first in the older, lower leaves. These smaller plants had fewer leaves, and the dry weight per leaf was less than in the controls. In all cases there was more starch (dry weight) the higher the leaf occurred on the stem. All tests indicated that the leaves of the controls had the most starch, those given one-half as much potassium stored

almost three-fourths as much starch, and those lacking potassium formed less than one-half the normal amount. It is therefore believed that the formation of carbohydrates in the leaf cells is distinctly less when potassium is lacking.

Selenium as a stimulating and possibly essential element for certain plants, S. F. and H. M. TRELEASE (*Science, 87 (1938), No. 2247, pp. 70, 71*).—The experiments briefly outlined indicate that selenium has a pronounced stimulating effect on *Astragalus racemosus*, and suggest that it may be essential for the development of this and other selenium indicator plants. The possible evolutionary relations of these findings are pointed out.

The absorption of selenium by citrus and by grapes, W. M. HOSKINS. (Univ. Calif.). (*Science, 87 (1938), No. 2246, pp. 46, 47*).—Selenium averaged 0.25 p. p. m. in the upper 3 ft. of certain untreated soils tested, and ranged from 0.27 to 0.91 p. p. m. in the same soils in plats sprayed with Selocide from two to six times for spider mite control. The concentration in the pulp of citrus fruit from these plats did not exceed 0.12 p. p. m., which was equaled in fruit from an unsprayed plat. Grapes washed to remove surface deposit showed 0.64 p. p. m. after 5 sprays.

Comparative toxicity of selenates and selenites to wheat, A. M. HURD-KARRER (*Amer. Jour. Bot., 24 (1937), No. 10, pp. 720–728, figs. 3*).—"The comparative toxicity of selenates and selenites [to wheat seedlings] depended on the concentration of available sulfate. Toxicity of the selenates decreased progressively with increasing sulfate sulfur, while that of the selenites was greater with high concentrations of sulfate than at intermediate ones, with the result that at sulfur concentrations below about 30 p. p. m. selenate selenium was more toxic than that of selenite, while at the high sulfur concentrations the selenite selenium was the more toxic. With 3 p. p. m. selenium, the snow-white selenium chlorosis occurred at all sulfur levels up to about 30 p. p. m. in the case of selenate selenium, but 6 p. p. m. sulfur completely inhibited it in the case of selenites. The progressive decrease in the toxicity of the selenates with increasing sulfate was associated with a corresponding decrease in the absorption of selenium into both tops and roots. With selenites, sulfate had but little effect on the quantity reaching the tops, and high sulfate concentrations increased the amount of selenium accumulated in the roots. An explanation is proposed, based on the fact that selenites are the more easily reduced to elemental selenium in plant cells."

The role of vitamins in plant development, J. BONNER (*Bot. Rev., 3 (1937), No. 12, pp. 616–640*).—This general review discusses the subject under bios, accessory growth substances for bacteria, symbiosis and vitamin interaction, and accessory growth substances for higher plants. It is emphasized that the study of these growth factors is only begun. "The accessory factors themselves are not yet completely known. The ways in which each substance acts remain to be elucidated. And, even more important from a morphogenetic standpoint, the substances thus far investigated appear to be very generally and rather unspecifically necessary for the growth process as a whole. The substances responsible for the direction of growth, for development and differentiation, still offer an almost virgin field." A bibliography of 153 titles is appended.

Partial purification of a vitamin-like substance which stimulates sexual reproduction in certain fungi, L. H. LEONIAN and V. G. LILLY. (W. Va. Expt. Sta.). (*Amer. Jour. Bot., 24 (1937), No. 10, pp. 700–702*).—In this study many species of *Pythium* and *Phytophthora* failed to form sexual bodies in synthetic media, but garden peas proved a good source of the needed organic material for their development. A method of purifying the active fraction from mature garden peas is outlined, the final product of which is a nearly colorless, viscous

liquid which, depending on the organism used, is active in concentrations of one part per million to one per ten million.

Growth substance determinations, S. GRANICK and H. W. DUNHAM (*Science, 87 (1938), No. 2246, p. 47*).—When a growth substance is applied to the cut surface of the hypocotyl of etiolated seedlings of *Lupinus albus*, decapitated below the cotyledons, elongation of the hypocotyl takes place in the presence of light and is proportional to the concentration of the growth substance.

Nutrient deficiencies and growth hormone concentration in Helianthus and Nicotiana, G. S. AVERY, JR., P. R. BURKHOLDER, and H. B. CREIGHTON (*Amer. Jour. Bot., 24 (1937), No. 8, pp. 553–557, figs. 3*).—It was found that growth hormone concentration varies with growth vigor, and that both may be controlled by varying the nitrogen supply, viz, no nitrogen, no growth, and no growth hormone. The synthesis of new protoplasm at growing points of plants was accompanied by growth hormone production. Whether the relationship to growth is that of cause or effect is still uncertain, but the evidence is deemed clear that growth hormone is produced in adult plants in regions (e. g., shoot tips) where there is continued meristematic activity.

Growth hormone in terminal shoots of Nicotiana in relation to light, G. S. AVERY, JR., P. R. BURKHOLDER, and H. B. CREIGHTON (*Amer. Jour. Bot., 24 (1937), No. 10, pp. 666–673, figs. 8*).—When shoot tips of Turkish tobacco plants were kept in darkness the growth hormone disappeared, but when the plants were placed under different light intensities, it reappeared within 18 hr., recovery being proportionately greater under the higher intensities. Under a 1,000-w Mazda lamp at 15 in. a uniform high level of hormone concentration was established after 69 hr. Under normal day and night a reduced CO_2 supply also cut down on the hormone content. With reduced CO_2 and continuous light, the growth hormone content was proportionally greater under the higher light intensities. In one series of tests higher growth hormone concentrations occurred in plants exposed to the red and blue parts of the spectrum. Higher concentrations of CO_2 likewise favored higher hormone concentration under certain wavelengths, but the experiments with monochromatic light are not considered conclusive. "The formation of growth-regulating substances in the shoot tips of plants apparently is associated with growth, particularly meristematic activity and the accompanying synthesis of new protoplasm. It remains to be shown whether light has any effect on the production of growth hormones other than indirectly through synthesis of carbohydrates."

Responses of stock seedlings to heteroauxin applied to the soil, S. S. GREENFIELD (*Amer. Jour. Bot., 24 (1937), No. 8, pp. 494–499, figs. 6*).—In groups of ***Matthiola incana*** seedlings treated with various aqueous concentrations of heteroauxin applied to the soil, the lowest concentrations produced no observable effect but a second range accelerated growth. The next higher range did not affect the linear growth rate, but produced bud inhibition and thickening and whitening of the stems (which also appeared in the last or toxic range). In the last range, inhibition of growth and epinastic curling of the cotyledons also occurred. A hypothesis is offered in explanation of the ability of heteroauxin to stimulate growth in certain plants while it fails to do so in others.

Growth substances for fungi, V. G. LILLY. (W. Va. Expt. Sta.). (*W. Va. Univ. Bul., 38. ser., No. 3–11 (1937), pp. 95–103*).—Following a review of pertinent literature, data showing garden peas to contain a growth-promoting substance for ***Phytophthora cactorum*** and the initial steps in its purification are given. It was found to be thermostable, insoluble in ether, ligroin, and methyl cellosolve, but soluble in alcohol, acetone, carbon tetrachloride, and benzene. The chemical nature of this substance is at present unknown.

β-Indolylacetic acid, tested on 75 fungus species, not only failed to promote growth but acted as a toxic substance.

Some effects of methyl cholanthrene on the morphology and growth of yeasts, C. W. Dodge (*Ann. Missouri Bot. Gard., 24 (1937), No. 4, pp. 583–590, pl. 1*).—"Methyl cholanthrene, the most potent of the carcinogens so far reported, profoundly affects the morphology and growth of yeasts. Giant cells and increased differentiation of cells within the colony occur in cultures of *Saccharomyces ellipsoideus* Hansen, champagne strain, after two months. Total dry weight and fermentation are increased approximately one-third in saturated methyl cholanthrene peptone-glucose solution."

Straight growth of the Avena coleoptile in relation to different concentrations of certain organic acids and their potassium salts, B. A. Scheer (*Amer. Jour. Bot., 24 (1937), No. 9, pp. 559–565, figs. 5*).—A "straight growth" method (total increase in length of decapitated oat coleoptiles) is described for measuring the effectiveness of growth-stimulating substances. The following were tested over a wide range of concentrations by this and the oat coleoptile curvature methods: 3-indoleacetic acid, potassium 3-indoleacetate, α-naphthaleneacetic acid, and potassium α-naphthylacetate, the indole compounds proving most effective. The optimum concentrations were much higher when tested by straight growth than by the unilateral growth or curvature method, and the concentration range over which growth was promoted (up to the optimum) was consequently much wider by the former method. The decrease in growth promotion at successively higher concentrations than that for optimum growth is interpreted as indicating increased toxicity of the substances being tested. This cannot be tested by the oat curvature method. The difference in total length of test coleoptiles as compared with controls results from cell elongation rather than cell division. Growth induced by these chemical stimulators is interpreted as evidence of their longitudinal movement. Potassium α-naphthylacetate apparently spread evenly throughout the coleoptile, while α-naphthaleneacetic acid stimulated growth mainly in the upper zones and therefore presumably had spread only through these zones. The indole compounds induced the largest growth increases in the midregion of the coleoptile.

"Distribution of the substances in the coleoptile could be determined by 'recovery' tests within the limits of the method used. The fact that growth-stimulating substances could not be detected in the lower regions of the coleoptile, despite the fact that growth in these regions was stimulated, suggests that the 'recovery' method is not a good measure of the distribution of these compounds. Their longitudinal movement could be shown more readily by growth increases brought about by them."

Extent of proteolysis by mold and bacterial enzymes, J. Berger, M. J. Johnson, and W. H. Peterson. (Univ. Wis.). (*Enzymologia, 4 (1937), No. 2, pp. 31–35, fig. 1*).—Gelatin, lactalbumin, casein, egg albumin, and edestin were hydrolyzed 82–100 percent by the enzymes of *Aspergillus parasiticus*. With *A. alliaceus*, the rate and extent for gelatin depended on the enzyme: substrate ratio and on the dilution. The extent of hydrolysis of gelatin and casein by mold enzymes was about the same at pH 5.5 and 7. An enzyme preparation from *Bacillus megatherium* hydrolyzed gelatin and casein 72 and 97 percent.

On the determination of plant enzymes, Z. I. Kertesz. (N. Y. State Expt. Sta.). (*Plant Physiol., 12 (1937), No. 3, pp. 845–851*).—An attempt is made to show some of the vital points which must be considered in determining plant enzymes. With the application of the methods of physical chemistry knowledge of protoplasm is rapidly increasing, but still more progress is needed before the condition of the enzymes in the cell can be definitely known. On the

other hand, knowledge of the enzymes is advancing rapidly. While enough is known of the factors which must be considered in connection with enzyme studies on plants, studies on the plant cell in its natural condition cannot yet be made. It is stressed as of the utmost importance that all work on plant enzymes be made by dependable methods, and that the greatest care be exercised in drawing conclusions from results obtained in vitro regarding the natural condition, activity, and role of enzymes within the plant cell. A bibliography of 12 references is included.

Apparatus and methods for micro-incineration, S. H. Gage. (Cornell Univ.). (*Stain Technol.*, *13* (*1938*), *No. 1*, *pp. 25–36*, *figs. 9*).—The author describes the Policard electric furnace, explains the method of preparation and sectioning objects for incineration, and the process itself. The ordinary microscope used has an Abbé or aplanatic substage condenser with central dark-stops (of 10, 15, and 20 mm) for the different objectives, which range from 16 mm to oil immersions (those with powers above 16 mm having iris diaphragms). The great advantage is stressed of having some sections of an object incinerated and neighboring sections stained and mounted for comparison, in the one case with the dark-field and in the other with the bright-field microscope. The method of calibrating the furnace is given, so that the temperature may be known at each step of the incineration. A bibliography of 13 references is given.

A bleaching and clearing method for plant tissues, G. L. Stebbins, Jr. (*Science*, *87* (*1938*), *No. 2245*, *pp. 21, 22*).—In a rapid method devised for the study of the anatomy of the florets of the Compositae, the flower or organ is removed from the plant or dried specimen, boiled 2–3 min. in water, then placed for 24 hr. in a mixture of 2 parts concentrated ammonium hydroxide and 1 part hydrogen peroxide for relatively colorless objects. If the organ contains much chlorophyll or is badly oxidized, brown or blackish, high concentrations of H_2O_2, up to 1 to 1 mixture, are necessary. For unusually opaque organs the solution should be renewed and the specimen treated for a second or third day. After placing in 95 percent alcohol for 1–12 hr., most preparations can be studied without staining. The results obtained in studying certain dicot stigmas and ovaries of Cichorieae by this method are presented.

A new home-made embedding plate, J. R. King. (Univ. Calif.). (*Stain Technol.*, *13* (*1938*), *No. 1*, *pp. 23, 24*, *fig. 1*).—The plate described and illustrated "was designed to facilitate the embedding of more than a few specimens." It "eliminates the necessity of moving the embedding dish for cooling by the presence of circulating water in the trays, which rapidly cools the paraffin after the specimens are arranged."

The flora of Hampshire County, West Virginia, W. M. Frye (*W. Va. Univ. Bul.*, *35. ser.*, *No. 15* (*1935*), *pp. 59–82*, *fig. 1*).—The main body of this contribution consists of a list of plants by scientific and common names, arranged by taxonomic groups from the ferns to the composites.

Rotenone-yielding plants of South America, B. A. Krukoff and A. C. Smith (*Amer. Jour. Bot.*, *24* (*1937*), *No. 9*, *pp. 573–587*, *figs. 5*).—Ten rotenone-yielding species (*Derris amazonica*, *Lonchocarpus sylvestris* n. sp., *L. martynii* n. sp., *L. floribundus*, *L. rariflorus*, *L. utilis* n. sp., *L. urucu*, *L. chrysophyllus*, and *Lonchocarpus* spp.) are discussed in detail, with special reference to native names, distribution, economic importance, specimens examined, descriptions and comparisons of foliage for identification of sterile material, and notes for field workers.

Wood anatomy of certain South American rotenone-yielding plants, A. J. Panshin. (Mich. State Col.). (*Amer. Jour. Bot.*, *24* (*1937*), *No. 9*, *pp.*

587–591, figs. 10).—This contribution includes data for nine of the species noted above. General descriptions, as well as the minute anatomy of the stems and roots, are considered.

Nomenclature for the colon group, R. S. Breed and J. F. Norton (*Amer. Jour. Pub. Health, 27 (1937), No. 6, pp. 560–563*).—This article discusses the various terms which are commonly used to designate the aerobic, non-spore-forming, lactose-fermenting bacteria commonly encountered in the bacteriological examination of water and milk supplies. It is recommended that the term "coliform" be generally adopted to designate this group of bacteria used as a measure of pollution of water and, further, that when the same term is applied in milk and oyster examination it should be used with a similar meaning.

GENETICS

Cucurbita hybrids, G. P. Van Eseltine (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 577–581*).—Discussing the botanical distinctions between *C. maxima*, *C. pepo*, and *C. moschata* and efforts in the past to produce species hybrids, the author outlines briefly the results of experiments at the New York State Experiment Station conducted in part with a view to learning the extent of variation in inheritance of characters useful taxonomically. In 1934, when the first crop of F_1 plants was grown, none of the hybrids with *C. moschata* as pistillate parent showed the least sign of mosaic, despite the fact that the field was swept with the disease. *Moschata-maxima* combinations showed staminate sterility but were easily backcrossed with the parents. The *pepo* × *maxima* crosses produced relatively few fertile seeds, but the *moschata* × *pepo* hybrids were very prolific.

Inheritance in Nicotiana, II, III, J. A. B. Nolla (*Jour. Heredity, 27 (1936), No. 3, pp. 121–126, figs. 2; 29 (1938), No. 1, pp. 43–48, figs. 3*).—Two papers are included (E. S. R., 72, p. 752).

II. *"The conception of reaction system contrasts in heredity."*—The F_1 hybrids Ceniza ("glaucous" and hairy filament characters) and Consolation (yellow plant character), varieties of *N. tabacum*, with *N. sylvestris* showed that these characters were not dominant in the crosses. The author finds that these results do not conform with the theory of reaction systems advanced by Clausen and Goodspeed, which claims dominance of the *tabacum* system over the *sylvestris* system. It is suggested that genic quality may more properly explain the observed phenomena than differences in the system as a whole.

III. *A study of the character for mosaic resistance in Nicotiana tabacum L.*—Using the strain of virus previously employed, the F_1 generation in crosses between susceptible and resistant varieties proved susceptible, indicating recessiveness in the resistant character. On the basis of evidence from the F_1, F_2, and backcross progenies of crosses between resistant and susceptible varieties, it is concluded that duplicate factors are responsible for the inheritance mechanism of these two characters, resistance following only when the two factors are in the recessive condition. The duplicate factors are designated by the formula $R_{m_1}r_{m_1}R_{m_2}r_{m_2}$.

Induction of polyploidy in Nicotiana, W. H. Greenleaf. (Univ. Calif.). (*Science, 86 (1937), No. 2242, pp. 565, 566*).—Heteroauxin paste (indole-3-acetic acid in lanolin 1:100) applied to cut ends of stems of *N. sylvestris-tomentosa* and *N. sylvestris-tomentosiformis* hybrids resulted in callus tissue from which after about 6 weeks in a shaded greenhouse numerous rapidly developing buds were produced which grew into well-formed shoots. Many of these were tetraploid, or modified diploids or tetraploids. Similar results were produced outdoors with *N. glauca*, *N. tomentosa*, *N. tomentosiformis*, *N. tabacum*, F_1 *N. glutinosa-tomentosa*, and other hybrids.

A male-sterile onion, H. A. Jones and S. L. Emsweller. (Calif. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 582–585*).—An Italian Red onion, completely self-sterile but capable of producing umbels, was discovered in 1925. In an attempt to combine the vigor, seeding habit, and other desirable characters of the male strain, controlled crosses were made with other varieties. In the first generation of the male-sterile × Lord Howe Island, the hybrids displayed a marked tendency not to bolt. The nonbolting tendency was apparently dominant but was affected in expression by prevailing temperatures. In subsequent crosses it was observed that where inbred strains were used as pollen parents the progeny were more uniform in size, shape, and color.

Chromosome numbers in apples and pears [trans. title], E. Johansson (*Sveriges Pomol. För. Årsskr., 38 (1937), No. 4, pp. 193–204, figs. 3, Eng. abs., pp. 203, 204; also Meddel. Perm. Kom. Fruktodlingsförsök* [*Sweden*], *No. 44 (1938), pp. 12, figs. 3, Eng. abs., pp. 11, 12*).—Studies with diploid and triploid varieties of apples and pears showed a general tendency for thicker leaves and longer stomata in the triploids. Observations on the chromosome numbers in seedlings of crosses between diploid and triploid varieties showed them to be mostly aneuploids. For example, 10 seedlings from a cross between Husmoder × Stenbock had, respectively, 40±, 42, 45, 42, 44, 45, 40, 42, 44±, and 47 somatic chromosomes. In a cross between Belle de Boskoop ($2n=51$) and Filippa ($2n=34$), 1 seedling had 68 chromosomes and grew much more vigorously than did its sister plants. Crosses between diploids yielded seedlings with 34 somatic chromosomes.

Chimeras and bud selections, R. E. Gibson (*Amer. Fruit Grower, 57 (1937), No. 10, pp. 8, 9, 17, figs. 4*).—An up-to-date review is given of the situation with regard to chimeras in apples, pears, and other fruits, showing how frequently such occur. Illustrations are presented to show some of the actual types observed. Not all chimeras are, by any means, in the the directions of improvement, making bud selection important in three ways—(1) the prevention of deterioration, (2) the improvement of commercial varieties, and (3) the attainment of final stability.

Meiosis in an F_1 Viola hybrid and its reciprocal, D. Manch. (Vt. Expt. Sta.). (*Amer. Jour. Bot., 24 (1937), No. 10, pp. 678–683, figs. 16*).—These studies indicate meiosis in *V. ambigua* and *V. odorata* to be regular. "In *V. ambigua* × *V. odorata* and *V. odorata* × *V. ambigua*, 7–9 bivalents are present at diakinesis. One chromosome pair is associated with the prophase nucleolus. The univalents generally lie in the region of the equatorial plane at metaphase. Some of these pass at random to the poles without dividing along with the regularly disjoined bivalents; others lag and divide. The lagging-dividing univalents, as a rule, are not included in the major nuclei but form micronuclei. The chromosome numbers in the major interkinetic nuclei vary from 7–11. One chromosome is associated with the interkinetic nucleolus. The second division is regular in both major nuclei and micronuclei. Polyspory is frequent."

The origin of abnormal rust characteristics through the inbreeding of physiologic races of Puccinia graminis tritici, T. Johnson and M. Newton (*Canad. Jour. Res., 16 (1938), No. 1, Sect. C, pp. 38–52, pl. 1*).—This inbreeding through selfing of certain selected strains for several successive generations gave rise to rust strains with various abnormal characteristics manifested in the uredial, telial, pycnial, and aecial stages. These abnormalities include (1) decreases in sporulation vigor, (2) abnormal uredial color, (3) decrease in pathogenic vigor in certain strains, (4) loss of ability to produce aecia on the barberry, and (5) development of uredia and telia on the barberry by some strains that have partially or wholly lost the capacity to produce aecia.

"The development of abnormal strains of rust is not an inevitable consequence of inbreeding, as many inbred strains show no abnormal characteristics. It is suggested that the abnormal characteristics are, in most cases, the result of recessive mutations that have taken place in the past history of the rust, the part played by the selfing being that of segregating and recombining the mutant factors in a homozygous state, under which condition their effects are manifested in various types of abnormalities."

Dionnes of the goat world, R. C[OOK] (*Jour. Heredity, 29 (1938), No. 1, pp. 17–20, figs. 2*).—A case of quintuplets in goats, which occurred several times in the same herd, is noted.

Sable coat color in Cockers, J. McI. PHILLIPS (*Jour. Heredity, 29 (1938), No. 2, pp. 67–69, figs. 2*).—A dark red Cocker Spaniel bitch with many black hairs distributed through the coat was produced by black parents in a litter with several red puppies. Mated with a black dog, heterozygous for the black and tan pattern, there were produced one sable, one black, and three red puppies. No other sable ancestors were known in either line. No sables were produced when the bitch was mated with a homozygous black or a black-nosed dark red dog. This sabling seemed to be recessive to self-black but dominant over red, fawn, tan, etc., as the sable of St. Bernards and the brindle of Great Danes and Greyhounds.

The embryology of the guinea pig.—I, A table of normal development, J. P. SCOTT (*Amer. Jour. Anat., 60 (1937), No. 3, pp. 397–432, figs. 15*).—A description is given of the growth and development of guinea pig embryos of different ages up to 26 days after copulation. Externally the visceral arches and internally the circulatory system showed the most definite morphological changes correlated with age.

The embryology of the guinea pig.—II, The polydactylous monster—a new teras produced by the genes PxPx, J. P. SCOTT (*Jour. Morphol., 62 (1938), No. 2, pp. 299–321, figs. 23*).—Study of the polydactylous monster produced by the genes *PxPx*, previously reported by Wright (E. S. R., 74, p. 22), showed that a center of digit formation located on the lateral side of the foot controls skeletal and dermal structures. Although the heterozygote gives it an atavistic appearance, the gene is not atavistic.

The embryology of the guinea pig.—III, The development of the polydactylous monster—a case of growth accelerated at a particular period by a semi-dominant lethal gene, J. P. SCOTT (*Jour. Expt. Zool., 77 (1937), No. 1, pp. 123–157, figs. 33*).—The study noted above led to the conclusion that the condition is due to a growth-stimulating substance manufactured by homozygous *PxPx* embryos a short time after 17.5 days of gestation. The substance acts on the organs growing most rapidly at the time, and produces uncoordinated development of certain related parts which is recognizable at about 18.5 days, eventually ending in death of most of the monsters between 26 and 27 days of age. Another lethal period for 8 percent of the monsters was at parturition. The monsters showed extreme polydactyly, telescoped sternum, and missing tibia.

Inheritance of pectoral buff spotting in the cactus-mouse, Peromyscus eremicus, F. H. CLARK (*Jour. Heredity, 29 (1938), No. 2, pp. 79, 80*).—Pectoral buff spotting in the cactus-mouse involving the presence of a variable number of hairs with a yellow terminal or subterminal band in the pectoral region was found to be inherited essentially as a unit character controlled by a recessive gene, although other modifying factors or environmental conditions evidently operated.

Preliminary studies of hereditary variation in the axial skeleton of the rabbit, P. B. Sawin (*Anat. Rec., 69 (1937), No. 4, pp. 407–428, figs. 3*).—Study of the vertebral column variations in over 3,000 rabbits by X-ray and dissection revealed four types as regards the number of thoracic and lumbar vertebrae. Although a tendency toward the manifestation of an additional pair of ribs and/or an extra lumbar vertebra seemed to have a genetic basis, no satisfactory Mendelian explanation was found. The additional skeletal units occurred more often in females, although they were transmitted by males as well.

Nematode resistance in poultry. (Kans. Expt. Sta.). (*Jour. Heredity, 29 (1938), No. 2, pp. 53, 54*).—Differences in the resistance of breeds and strains of poultry to the nematode *Ascaridia lineata* are noted.

Inheritance of certain "blue-black" patterns and "bleached" colorations in the domestic pigeon, W. F. Hollander. (Wis. Expt. Sta.). (*Genetics, 23 (1938), No. 1, pp. 12–23, fig. 1*).—A genetic analysis is given of several color types in pigeons. Matings involving the blue-black patterns suggested multiple alleles in the order of dominance—C^T (dark checker),>C (checker). >+(barred),>c (barless). Modifying factors were considered mainly responsible for the variability in expression of the C and C^T genes, although other alleles also seemed possible as explanations for the variability. Four factors, *o* (recessive opal), *Od* (dominant opal), *Of* (faded), and *my* (milky), were found to cause a bleached plumage very like B^a (ash). Recessive opal, *my*, and *Od* were autosomal, but *Of* was not tested for sex linkage. Survival of embryos was only 33.6 percent from eggs laid by extreme opals. The opal gene was closely linked with *C* in the checker series. A single recessive factor *sy* was found responsible for the syndrone designated as smoky.

"Clumsy" pigeons, W. F. Hollander. (Wis. Expt. Sta.). (*Jour. Heredity, 29 (1938), No. 2, pp. 65, 66, fig. 1*).—In these experiments about 30 homing pigeons, the progeny of normals, were found unable to locate home when only a few yards away. The so-called "clumsy" birds exhibited a visual defect. Histological study of the eye showed irregularity of the transverse markings of the rods and cones and oil droplets in the retina. The abnormality behaved as a unit character recessive to the normal in crosses with normals.

Ovulation in the ewe, J. Anderson (*Jour. Agr. Sci. [England], 28 (1938)*, No. 1, pp. 64–72).—Determination of the time of beginning and ending of oestrus in relation to ovulation in 31 Merino and Masai ewes in Kenya showed that ovulation usually occurred shortly after the end of the oestrus for ewes with oestrous periods ranging from 30 to 45 hr. In ewes with short oestrous periods, ovulation did not occur in less than from 23 to 25 hr. after oestrus.

Failure of thyroidectomy to influence the follicular components of the immature rat ovary, O. L. and S. L. Leonard (*Anat. Rec., 68 (1937), No. 2, pp. 249–252*).—Thyroidectomy in 24-day-old female rats had no significant influence on the follicles found in the ovaries from 6 to 8 days later, although thyroidectomized rats responded more effectively to follicle-stimulating hormones (E. S. R. 78, p. 616).

A summary of data for the effects of ovariectomy on body growth and organ weights of the young albino rat, C. B. Freudenberger and E. I. Hashimoto (*Amer. Jour. Anat., 62 (1937), No. 1, pp. 93–119, figs. 10*).—Ovariectomy of rats at 26 days of age with autopsy at 70 days was found to result in an increase in the size of nearly all the organs as compared with controls. On the other hand, the uteri of gonadectomized animals were reduced in size. It appeared from comparison with results at other ages that removal of the ovary hastens the rate of body and organ growth with the exception of the

genital system, eyeballs, and suprarenal glands. The data were recomputed for the 70-day group and discussed in terms of increase in milligrams or millimeters per 100 g of body weight.

The suppression of oestrus in the rat during pregnancy and lactation, T. McKeown and S. Zuckerman (*Roy. Soc. [London], Proc., Ser. B, 124 (1938), No. 837, pp. 464–475, pl. 1*).—Destruction by electrocautery of the corpora lutea in ovaries of rats on the third and seventh days of pseudopregnancy resulted in the appearance of pro-oestrus in 3 days in all of the seven animals. The suppression of oestrus in the first half of pregnancy was also found due to the presence of corpora lutea rather than to the uterine contents. During the second half of pregnancy, destruction of the corpora lutea was not followed by oestrus until the placentae were removed. The placenta seems to play an essential role in inhibiting oestrus during the second half of pregnancy. The removal of corpora lutea from lactating rats resulted in the return of oestrus in 6 days if the animals were weaned, but oestrus did not occur if suckling was continued.

Investigations on the duration of pregnancy in mares [trans. title], A. Mauch (*Ztschr. Zücht., Reihe B, Tierzücht. u. Züchtungsbiol., 39 (1937), No. 1, pp. 31–42, figs. 3*).—In a study at the National Institute for Animal Breeding, București (Bucharest), it was found that the average length of 1,629 normal gestations in mares was 336.53±0.263 days. The gestation period for male foals averaged 1.69 days longer than for female foals. Old mares had slightly longer periods than young mares. The gestation period for twins averaged about 10 days less than for single foals. Breed and climate had no influence on duration of pregnancy, while the month of breeding had the greatest influence of the factors studied. The stallion had no influence on the length of embryonic development for his foals, but daughters of an individual sire exhibited a typical gestation period range.

Do the spermatozoa influence the duration of pregnancy in cattle? T. Düring (*Ztschr. Zücht., Reihe B, Tierzücht. u. Züchtungsbiol., 39 (1937), No. 1, pp. 25–30*).—A study at the Animal Breeding Institute, Sweden, of the length of the gestation period of cows mated to seven different bulls gave evidence that the length of embryonic development was different for calves of the different sires. These average values ranged from 278.4 to 283.6 days, with indications that such differences were statistically significant.

The comparative behavior of mammalian eggs in vivo and in vitro.—III, Factors controlling the growth of the rabbit blastocyst, G. Pincus and N. T. Werthessen (*Jour. Expt. Zool., 78 (1938), No. 1, pp. 1–18, figs. 7*).—Rabbit ova removed from the Fallopian tubes exhibited in watch glass cultures a limited amount of growth, followed by herniation and collapse, even though progesterone or ascorbic acid was added to the medium (E. S. R., 76, p. 320). Growth to normal preimplantation size was obtained with rabbit serum. The effects of glutathione, progesterone, and ascorbic acid alone and in combination are discussed.

Fecundity of male rabbits as determined by "dummy matings," C. Macirone and A. Walton (*Jour. Agr. Sci. [England], 28 (1938), No. 1, pp. 122–134, pl. 1, figs. 4*).—Description is given of a method for the collection of rabbit semen by the use of the artificial vagina. In appraising the fertility of the males, the semen samples were considered with reference to volume and number of sperm, seasonal and individual variations, and effect of successive matings, as well as the behavior of the male toward live females and the dummy. On successive matings, the volume of ejaculate and number of sperms were reduced. Determination of the number of sperm present in the various sections of the sperm tract indicated that the vas deferens is emptied with each ejaculation

and some sperm come from the cauda epididymis. The sequence of events constituting the sexual response of the male followed by mating is described.

The relationships of the epithelial components of the pituitary gland of the rabbit and cat, A. B. Dawson (*Anat. Rec., 69 (1937), No. 4, pp. 471–485, pls. 2*).—A comparative study of the structure of the pituitaries of the cat and rabbit.

A male sex-stimulating and female sex-repressing fraction from the adrenal gland, F. M. Pottenger, Jr., and D. G. Simonsen (*Endocrinology, 22 (1938), No. 2, pp. 197–202*).—A white amorphous powder extracted from the adrenal gland was found on subcutaneous administration to female rats to cause a functional atrophy of the uteri and uterine horns. In male rats increases were induced in the weights of the testes and in spermatogenesis.

The comparative efficacy of various androgens as determined by the rat assay method, C. D. Kochakian (*Endocrinology, 22 (1938), No. 2, pp. 181–192, figs. 6*).—A comparison of the potency of several androgens showed that, as determined by the weight increases induced in the prostates and seminal vesicles of rats, testosterone propionate, testesterone acetate, testesterone diacetate, urine extracts, and testosterone were most effective. The high effectiveness of the urine extracts was attributed to unexplained causes other than the androgenic compounds present. The efficacy of the androgens was reduced by lengthening the time interval between injections from 24 to 48 hr.

Comparative action of injections of oestrin and a combination of oestrin and anterior pituitary-like substance on the anterior hypophysis, J. M. Wolfe (*Anat. Rec., 68 (1937), No. 2, pp. 237–248*).—Injections of 200 rat units of oestrin into mature and immature female rats resulted in a marked increase in the weight of the pituitaries as compared with the pituitaries of control animals or of those of rats injected with anterior pituitary-like hormones. The cell types present were also different in the two groups. The degranulation of the chromophiles and the reduction of their relative percentages were more marked in those animals receiving oestrin alone. The combined treatments resulted in a marked increase in the weight of the ovaries. As the reaction of the pituitaries of normal and gonadectomized females to oestrin injections was essentially the same, study was made of the effect of progesterone administration in addition to oestrin. Again the pituitaries responded similarly.

Pro-gonadotropic sera, I. W. Rowlands (*Roy. Soc. [London], Proc., Ser. B, 124 (1938), No. 837, pp. 492–503*).—The serum of a sheep and a goat which had received injections of extract of sheep and pig pituitary, respectively, augmented in the first the activity of an extract of sheep pituitary on test rats, and in the second case the action of pig, sheep, and ox pituitary extract in promoting ovarian growth in immature rats. The serum from the goat inhibited the gonadotropic action on the rat ovary of extracts of horse pituitary, pregnant mare serum, and human pregnancy urine.

The specificity of antigonadotropic sera, I. W. Rowlands (*Roy. Soc. [London], Proc., Ser. B, 124 (1938), No. 837, pp. 503–521, figs. 3*).—Complete species specificity was shown by the reaction of antisera in the rabbit to gonadotropic extracts of human pregnancy urine and pregnant mare serum, whereas antisera to similar extracts of pituitary origin exhibited incomplete species specificity. Complete source specificity was found only in reactions of an antiserum to gonadotropic extracts of pregnant mare serum. More data are deemed needed to clarify this subject, especially before the specificity of antigonadotropic sera can be ascribed to immunological factors.

The effect of continued theelin injections on the body growth and organ weights of young female rats, C. B. Freudenberger and F. W. Clausen

(*Anat. Rec., 68 (1937), No. 2, pp. 133–144, fig. 1*).—Growth in body weight and in most of the organs of immature (3-week-old) female rats injected for an average of 78 days with 200 international units of theelin every other day was definitely retarded as compared with the controls. The vaginas opened in most of the theelin-treated rats at the age of 25 days but at an average of 39 days in the controls.

The effect of sex hormones on lactation in the rat, S. J. Folley and S. K. Kon (*Roy. Soc. [London], Proc., Ser. B, 124 (1938), No. 837, pp. 476–492, figs. 4*).—As determined by the growth curves in suckling rats, the administration of oestradiol monobenzoate or testosterone propionate inhibited lactation in normal lactating rats. Ovariectomy a few days after parturition had practically no influence on lactation, and the effects of oestradiol monobenzoate were less pronounced. There was no evidence that progesterone inhibited lactation in normal animals.

The effect of temperature on the sexual activity of non-migratory birds, stimulated by artificial lighting, H. Suomalainen (*Ornis Fenn., 14 (1937), No. 3–4, pp. 108–112, pl. 1, fig. 1*).—Temperature differences of approximately 20° C. had no noticeable effect on testicular development in the titmouse. Development was not retarded with temperatures as low as 0° under suitable light conditions or stimulated by temperatures as high as 16° without extra light.

An unprecedented record of sustained high egg production in the domestic fowl, G. O. Hall ([N. Y.] Cornell Expt. Sta.). (*Jour. Heredity, 29 (1938), No. 2, pp. 51–53, pl. 1, fig. 1*).—An account is given of a White Leghorn hen that produced 1,515 eggs in 8 yr., averaging over 200 eggs per year for her first 7 years' production.

FIELD CROPS

Grasses in Kansas, F. C. Gates (*Kans. State Bd. Agr. [Quart.] Rpt., 55 (1936), No. 220–A, pp. 349, pl. 1, figs. 494*).—This manual of grasses in Kansas includes descriptions, usually with illustrations, and indicated distributions of the grasses growing in Kansas, with appropriate keys to the tribes, genera, species, and varieties. In Kansas there are 85 genera, 235 species, and 27 varieties, the native grass flora containing 60 genera, 194 species, and 19 varieties. The work also contains information on the uses, distribution, characteristics, and nomenclature of grasses; a glossary, index, and lists of Kansas grasses; a preface by J. C. Mohler; a foreword by L. E. Melchers; and papers entitled Economic Value of Native Kansas Grasses, by A. E. Aldous (pp. 13–23), and Range Forage in Four Southwest Kansas Counties, by M. Evans (pp. 24–35).

Characteristics of major grassland types in western North Dakota, H. C. Hanson and W. Whitman. (N. Dak. Expt. Sta.). (*Ecol. Monog., 8 (1938), No. 1, pp. 57–114, figs. 12*).—The characteristics of 36 areas of grassland in the Little Missouri region of western North Dakota were studied, chiefly during the summer of 1935. The areas were classified in nine vegetation types, including grama-needlegrass-sedge, western wheatgrass-grama-sedge, little bluestem, sandgrass, sagebrush, saltgrass-western wheatgrass, saltgrass-alkali meadow grass, buffalo grass, and big bluestem. These types differed chiefly in botanical composition, topographic location, thickness of surface layer of dark soil, depth at which effervescence with HCl began, acidity or alkalinity of the surface horizons, total concentration of soluble salts, sodium and carbonate contents, soil texture, and colloidal content.

A definite relationship was evident between soil heterogeneity and vegetation heterogeneity. There were distinctive soil differences and vegetation differences between the types. Mechanical analyses of the soils indicated heterogeneity in textural types which corresponded, in a measure, to the heterogeneity in grassland vegetation types, but it was not assumed that textural differences are chiefly responsible for vegetational differences. Topographical position is deemed important because different topographical situations present different environments for the development of vegetation and soil types. Although the exact role of each influencing factor had not been determined, the duration of available soil moisture, depth to the water table, concentration of salts, and stage in various successional seres are all important in determining vegetation types in this region.

The grama-needlegrass-sedge type appeared to have reached the highest degree of stabilization in relation to the climate, and the soil of this type most nearly approaches the typical profile of the dark brown soils. The big bluestem type seemed to depend upon moisture additional to that received by precipitation. The other types appeared to be successional stages following erosion, deposition, salinization, overgrazing, or cultivation.

[Lawns and potatoes in Iowa] (*Iowa State Hort. Soc. Rpt., 71 (1936), pp. 214–220, 300–308, 308–310, 321–338, figs. 10*).—Experiment station contributions on lawns and potatoes include Turf Grasses and Their Adaptations to Iowa Conditions, by V. T. Stoutemyer (pp. 214–218), Keeping Lawns Free From Weeds and Diseases, by D. V. Layton (pp. 219, 220), and Drought Keeps Potatoes Alive, Water Ripens Them in Colorado, Nebraska, and on the Peat Beds (pp. 308–310) and Plot Work With Potatoes, Cabbage, and Onions on the Peat Beds in 1936 (pp. 321–338), both by C. L. Fitch (all Iowa); and Growth of the Potato, by F. A. Krantz (pp. 300–303), The New and Newer Varieties of Potatoes, by A. G. Tolaas (pp. 303–305), and Potato Demonstrations in Southern Minnesota, by R. C. Rose (pp. 306–308) (all Minn.).

The carbohydrate composition of corn and sorghum roots, J. P. Conrad. (Calif. Expt. Sta.). (*Jour. Amer. Soc. Agron., 29 (1937), No. 12, pp. 1014–1021, fig. 1*).—Further data bearing on the injurious aftereffects of sorghums on other crops (E. S. R., 59, p. 135) are reported. In preliminary tests under the same cultural conditions in 1927 total sugars as sucrose in the roots varied in different types and varieties of sorghums at maturity from about 15 to over 55 percent on the basis of dry organic matter, and varied in corn varieties from much less than 1 to about 4.5 percent. In 1928 under different soil moisture conditions, sugars in corn (King Philip Hybrid) usually decreased from amounts varying from about 8.5 to 18 percent at blooming down to amounts below 2.5 percent at maturity, suggesting movement of sugars to the ear during maturation. Sugars in sorghum (White Durra) usually remained above 16 percent from bloom to maturity, with many exceeding 30 percent. Indications were that sorghums cut back at maturity make new shoot growth at expense of sugars stored in the roots. In corn without seed-bearing ears at maturity in 1930, sugar percentages were consistently higher in both roots and stalks than in those plants with seed-bearing ears, especially in stalks. The data are held consistent with the view that corn is physiologically an annual while sorghums are perennials.

Effect of applications of fine limestone, I–III, A. A. Klingebiel and P. E. Brown. (Iowa Expt. Sta.). (*Jour. Amer. Soc. Agron., 29 (1937), Nos. 11, pp. 944–959; 12, pp. 978–989; 30 (1938), No. 1, pp. 1–9*).—The effects of small quantities of fine limestone applied in the row with the seed upon the yield and nitrogen content of sweetclover and alfalfa were studied on several soil types.

I. *The yield and nitrogen content of sweet clover and alfalfa grown on Shelby loam and Clinton silt loam.*—Treatments on these acid soils included unlimed, 500 lb. fine limestone in the row, 500 lb. beside the row, and 6,015 lb. per acre broadcasted. Regardless of how applied, limestone did not depress early growth on Shelby loam but did on Clinton silt loam. In general, fine limestone in the row or broadcasted in full applications on Shelby loam promoted plant growth, and full limestone applications resulted in greater yields of the two legumes than with limestone in or beside the row. Plants on fully limed soils were favored still more in nitrogen content of plants and in nodulation of roots. The crops on untreated soils had much lower total dry weights and total nitrogen contents than on limed soils. Both percentage and total content of nitrogen of plants grown on Shelby loam tended to increase in the order no treatment, limestone beside the row, limestone in the row, and full lime. Beneficial effects of small applications of fine limestone in the row were greater when measured by total dry weight than by total nitrogen of plants. Small amounts of fine limestone applied in the row, it was concluded, greatly benefited the growth of sweetclover and alfalfa in the two soils.

II. *The yield and nitrogen content of alfalfa grown on Tama silt loam from different areas.*—On three lots of Tama silt loam having lime requirements of 2.2, 3.4, and 4.7 tons per acre, respectively, the treatments included no treatment, $\frac{1}{24}$, $\frac{1}{12}$, and $\frac{1}{6}$ lime-requirement in the row, and full lime-requirement broadcast. Limestone did not depress early growth of alfalfa on 3.4- and 4.7-ton lime-requirement soils but did on the 2.2-ton soil. Fully limed soils produced greater yields of alfalfa with higher nitrogen content than soils receiving limestone in the row, all limed soils surpassing untreated soils in these respects. In general, the 2.2-ton soils surpassed the 3.4- and 4.7-ton soils in order. There was no difference in yield and nitrogen content of alfalfa on soils receiving the $\frac{1}{12}$ and the $\frac{1}{6}$ lime-requirement treatments. The percentage nitrogen content of tops and roots responded similarly to the several treatments. Roots of plants on fully limed soils bore more nodules than those on soils with row applications, and a distinct concentration of nodules on roots was found in the limed zone where larger quantities of fine limestone were applied in the row. No relations seemed to exist between a soil's lime requirement and the amount of fine limestone to be applied in the row. The total nitrogen content of alfalfa rose as applications of fine limestone in the row were increased. Conclusions were that only as the full lime requirement of a soil is approached would nitrogen fixation equal to that secured on the fully limed soils be obtained.

III. *The yield and nitrogen content of inoculated and non-inoculated alfalfa grown on Shelby loam.*—The same limestone treatments as in part 1 were used in this experiment. In the inoculated series a concentration of nodules was observed in the limed zone where the fine limestone was applied in the row. Mercury dust, used to control damping-off, probably prevented thorough inoculation of plants in this series. Plants on fully limed soils were higher in total dry weight and total nitrogen content than those on soils receiving limestone in or beside the row, all limed soils surpassing unlimed soils in these respects. In nitrogen content alfalfa, on the several limed soils, varied similarly regardless of degree of inoculation, but the total dry weight and total nitrogen content was substantially greater in the inoculated series. Alfalfa on soils receiving 500 lb. of fine limestone in the row yielded nearly as much as on the fully limed soils but contained much less total nitrogen. Apparently the partial liming of Shelby loam is quite favorable for the growth of alfalfa, but only as the full lime requirement of a soil is reached will maximum nitrogen fixation be obtained.

The productivity of alfalfa as related to management, L. F. Graber and V. G. Sprague. (Wis. Expt. Sta.). (*Jour. Amer. Soc. Agron., 30 (1938), No. 1, pp. 38–54, figs. 4*).—The productivity and duration of Canadian variegated alfalfa was compared under favorable conditions of management, including maintenance of the optimum level of fertility, ample summer and fall storage of food reserves, abundant vegetative winter cover, and absence of leafhopper damage, with alternatives of moderately low fertility, early cutting of the first growth and leafhopper injury (E. S. R., 73, p. 351), reduced winter cover, and reduced fall and summer storage of food reserves.

Cutting treatments affected the immediate productivity of alfalfa and also subsequent yields and survival. All fall cutting treatments were harmful, but late-fall cutting after maximum food storage had occurred was less detrimental as to productivity and survival than fall cuttings which reduced vegetative cover and autumnal storage of reserve foods. An optimum fertility level greatly increased productivity and duration compared with that on soil rather low in fertility, whether cutting treatments were favorable or unfavorable as to root storage, winter cover, and leafhopper damage. Cutting of the first growth 12 days earlier in 1932 and 1933 greatly lowered immediate and later yield and survival, depressed the productivity of the first growth, and resulted in severe infestations of leafhoppers. These caused heavy losses in productivity of the second growth, adverse effects in both cases being most pronounced when alfalfa had sustained winter injury induced by previous fall cutting treatments. Residual effects of the various cutting treatments applied to alfalfa, 1931–33, were reflected in the productivity of alfalfa in 1934.

A response of alfalfa to borax, L. G. Willis and J. R. Piland. (N. C. Expt. Sta.). (*Jour. Amer. Soc. Agron., 30 (1938), No. 1, pp. 63–67, figs. 2*).—The yellowed condition of alfalfa which occurred on some soils in midsummer was corrected by additions of borax in experiments. Manganese appeared to supplement the effect of borax. Although zinc and copper had antagonistic or negative effects, their combination with manganese produced results similar to those from borax. The borax effectively corrected the abnormal condition when applied in March but failed when used late in May in the same year. The yellowed condition, general on all alfalfa soils in North Carolina, seemed to be aggravated by liming and by liberal use of fertilizers high in soluble calcium salts. Abnormal infestation by orders of sucking insects seemed to be associated with the condition remedied by borax.

Barley varieties registered, III, IV, H. K. Hayes (*Jour. Amer. Soc. Agron., 22 (1930), No. 12, p. 1040; 29 (1937), No. 12, pp. 1032, 1033*).—Varieties of barley approved for registration since the previous report (E. S. R., 61, p. 220) included Spartan (E. S. R., 61, p. 330) and Regal, a smooth-awned, six-rowed variety resembling Manchuria.

The value of cover crops in continuous corn culture, T. E. Odland and H. C. Knoblauch. (R. I. Expt. Sta.). (*Jour. Amer. Soc. Agron., 30 (1938), No. 1, pp. 22–29*).—Some results are presented from a prolonged experiment (1894–1933) with rye and clover cover crops in continued corn culture. Variations in fertilization and disposition of the stover also were included.

Legume cover crops were the most effective in maintaining corn yields. Winter rye sown at the last cultivation of corn in the fall increased the average annual yield by 6 bu. per acre over adjoining no-cover-crop corn for 1900–1933. Increase of stover yields by both legume and rye cover crops was not so large proportionately as the increase in grain yield. Increase in the nitrogen content of the fertilizer by 50 percent on one-half of the rye cover crop resulted in an average annual increase of 12 bu. per acre over the half

with the regular amount of nitrogen. Although the total amount of soil nitrogen gradually decreased in all sections, the rate of decrease was lessened by both kinds of cover crops, which also increased the water-holding capacity of the soil. The practice of using cover crops for conserving soil productivity is considered as highly desirable under the conditions. A legume cover crop is preferred where it can be used successfully, yet rye also will show decided benefits to the soil and crop grown.

A physiological study of cold tolerance in corn, L. V. Sherwood. (Ill. Expt. Sta.). (*Jour. Amer. Soc. Agron., 29 (1937), No. 12, pp. 1022–1030, figs. 2*).—Cold-tolerant strains of corn appeared to have better stalk insulation against cold than did susceptible strains. Such tolerance seemed to be a function of the proteins. Protein variations in plants may account for differences in cold tolerance due to concurrent nutritional differences. Differences in cold tolerance of tissues resulting from exposure to chemical salts might be attributed to effects upon nutrition, the proteins being the constituents affected. Natural cold tolerance in a strain of corn in the seed stage, it was observed, could be retarded temporarily by soaking the seed in certain chemical solutions; the same chemical treatment might impart an induced cold tolerance to an otherwise susceptible strain. Protection of corn against cold injury by soaking the parental seed in chemical solutions, it seemed, probably affects the plant more in the younger stages and diminishes as the plant grows older.

Effect of fertilization on the composition of a Lufkin fine sandy loam and of oats grown on it, G. S. Fraps, J. F. Fudge, and E. B. Reynolds. (Tex. Expt. Sta.) (*Jour. Amer. Soc. Agron., 29 (1937), No. 12, pp. 990–996*).—The effects of fertilizers added during 8 yr. in the rotation cotton, corn, and oats in varying quantities up to 800 lb. of an 8–12–8 fertilizer per acre on the quantities of nitrogen, active phosphoric acid, active potash, and acidity in Lufkin fine sandy loam, and of the relation of these to the composition of oats grown thereon, were studied. The phosphoric acid and nitrogen contents of oats in a vegetative stage were related fairly well to the quantities of these constituents in the soil, but the relation was not close in oats cut near maturity. The relation with respect to potash was irregular at both growth stages. Of the total quantity of nitrogen added, from 50 to 70 percent was found in the surface 6 in. of soil, only a small amount penetrating into the subsoil; but only from 36 to 48 percent of the added phosphoric acid was found as active phosphoric acid in the surface 6 in. That phosphoric acid penetrated to a considerable depth was shown by the fact that the subsoil of plats receiving phosphoric acid contained about 2.5 times as much active phosphoric acid as plats which received none. Nearly all increases in active potash were due to increases in exchangeable potash. Potash also penetrated the subsoil but to a lesser extent than phosphoric acid. Addition of these constituents had little if any effect on soil acidity, which was increased by ammonium sulfate and decreased by manure.

Annual report of the Nebraska Potato Improvement Association for the year 1936–37, edited by H. O. Werner (*Nebr. Potato Impr. Assoc. Ann. Rpt., 18 (1937), pp. 63, figs. 3*).—Papers presented at the 1937 meeting at Scottsbluff and Alliance included Crop Rotation Work at the Scottsbluff Field Station, by L. Harris (pp. 5–12), Effect of Various Irrigation Potato Rotations Upon Soil Fertility (pp. 12–17) and Is There a Fertility Problem on Dry Land in Western Nebraska? (pp. 34–36), both by H. F. Rhoades, and Good Stands of Potatoes—Experimental Evidence Concerning Factors Affecting Them (pp. 36–50) and Western Dry Land Potato Crop Depends Upon Moisture Stored in Soil (pp. 53–55), both by H. O. Werner (all Nebr.); Methods of Irrigation and

Preparing Land for Irrigation, by L. Bowen (pp. 18–24), Tolerance of Certain Potato Varieties to Psyllid Yellows, by M. F. Babb and J. E. Kraus (pp. 26–30, 31), and How Other States Are Handling Their Potato Problems, by E. F. McKune (pp. 55–59) (all U. S. D. A.); Potato Insect Years, by L. B. Daniels (pp. 24, 25) (Colo.); Potato Production Methods That Have Been Successful on Dry Land in Western Nebraska, by W. T. Young, Jr. (pp. 30, 32–34); and Western Nebraska Weather, by L. L. Zook (pp. 50–52) (Nebr. and U. S. D. A.).

Preliminary report on the use of spring grown seed for planting the late potato crop on the Eastern Shore of Maryland, R. A. Jehle, E. A. Walker, and J. W. Heuberger. (Md. Expt. Sta.). (*Amer. Potato Jour., 14 (1937), No. 9, pp. 290–293*).—Seed treatment studies involving several varieties of potatoes indicated that there may be good commercial possibilities with the Warba variety in the production of a late potato crop in Maryland from spring-grown seed treated by soaking the cut tubers for 1 hr. in a solution of sodium thiocyanate (1 lb. to 12 gal. of water) immediately before planting.

Storage temperature studies with Irish Cobbler seed potatoes, R. A. Jehle and E. A. Walker. (Md. Expt. Sta.). (*Amer. Potato Jour., 14 (1937), No. 12, pp. 394–410*).—Potato storage temperature studies were made to overcome disadvantages from the use of home-grown seed for the early commercial crop on the Eastern Shore. When kept at ordinary storage temperatures (about 40° F.) during the entire storage period, northern- and mountain-grown Irish Cobblers germinated and matured about 10 days earlier than late-grown Eastern Shore seed. Raising the storage temperature of the later seed stimulated sprout growth in a measure, depending upon the rise in temperature and duration of exposure thereto. Evidently late-grown Eastern Shore seed might be caused to germinate and mature as early as the other two types. Effects of the various storage temperatures on yields of the early crop are influenced greatly by climatic conditions. Late-germinating seed does best in a dry early season and late rains, while early germinating seed does best with early rains and dry later season. Mountain-grown seed kept at 50° outyielded the same seed kept at 40° for the early crop, but further rise in storage temperature lowered yields.

Physical-chemical analysis of expressed sap indicated a greater dry matter percentage for both Eastern Shore and mountain-grown seed at 50° storage and greater total moisture at 40°. Total moisture of Eastern Shore tubers decreased with prolonged storage at 60°, and Eastern Shore tubers contained more total moisture at all storage temperatures than mountain-grown seed. Sap from both Eastern Shore and mountain-grown tubers showed a higher pH value at 50° than at 40° constant storage temperature, while the osmotic pressure and the specific conductance values were higher at 40° storage temperature for Eastern Shore than for mountain-grown seed.

Some important factors to consider in selecting seedlings, R. K. Conant (*Hawaii. Planters' Rec. [Hawaii. Sugar Planters' Sta.], 41 (1937), No. 4, pp. 307–318*).—An analysis is made of the relationship of juice quality, closing-in ability, ease of harvesting, and other varietal characteristics of sugarcane to the labor requirements and costs of cultivation, harvesting, delivering, manufacturing, etc.

Root studies of four varieties of spring wheat, V. C. Hubbard (*Jour. Amer. Soc. Agron., 30 (1938), No. 1, pp. 60–62*).—The number of fibrous or hair roots per 2-cm section of the roots and the weight per unit section of roots of four spring wheat varieties, differing in yield at the Northern Great Plains Field Station, Mandan, N. Dak., and believed to differ in drought resistance, were determined for different soil levels to a 36-in. depth in 1933 and 1934. Ceres

and Reliance had slightly more hair roots per unit section of root than Marquis and Hope and more hair roots per plant. The data were regarded as indicative only of a relation between yield under conditions of drought and numbers of hair roots per unit length of root and per plant. There was little evidence of a relation between differences observed in diameter and weight of roots per unit length and yield or drought resistance.

Registration of improved wheat varieties, XI, J. A. Clark (*Jour. Amer. Soc. Agron., 29 (1937), No. 12, pp. 1031, 1032*).—Varieties of wheat approved for registration (E. S. R., 76, p. 623) included Canawa soft red winter wheat (E. S. R., 75, p. 775) and Apex, a hard red spring wheat developed by the University of Saskatchewan from H-44-Double Cross (F_1) × Marquis. Brief descriptions and records of performance are given.

Farm and garden seeds, S. P. Mercer (*London: Crosby Lockwood & Son, [1938], pp. 205, figs. 129*).—Practical information is given on the nature of a seed, commercial seed production, seed testing, crop and weed seeds, and by A. W. Monro on the provisions and administration of the Seeds Act, 1920. Data on crop seeds and practical seed testing are appended.

Nut grass eradication studies, I, II. (Ala. Expt. Sta.). (*Jour. Amer. Soc. Agron., 29 (1937), No. 12, pp. 1007–1013, fig. 1; 30 (1938), No. 1, pp. 18–21*).—Two studies are reported.

I. *Relation of the life history of nut grass, Cyperus rotundus L., to possible methods of control,* E. V. Smith and G. L. Fick.—The nutgrass plant is described as consisting underground of a system of roots, tubers and basal bulbs, and rhizomes and aboveground of rosettes of leaves and umbel-bearing scapes. Apical dominance has been shown to exist in both the tuber and the system as a whole. Tubers and basal bulbs are the principal means by which the pest reproduces and spreads in the Southeast. A new tuber may be produced in 21 days. In Norfolk sandy loam most of the tubers were found in the upper 6 in. of soil and none were found deeper than 16 in. Tubers were killed readily by drying; isolated tubers were killed by 4 days' exposure to direct sunlight. The critical moisture content usually was about 15 percent. Temperatures of 60° C. (140° F.) and above killed tubers in 1 hr. At 50° much longer exposures were needed, but exposure to a temperature of −3.8° for 8 hr. was not lethal.

II. *The eradication of nut grass, Cyperus rotundus L., by certain tillage treatments,* E. V. Smith and E. L. Mayton.—Plowing or disking at intervals of 3 weeks or less during two consecutive growing seasons completely eradicated nutgrass on a Norfolk sandy loam soil. Such treatments reduced the infestation about 80 percent the first year.

HORTICULTURE

Growing plants without soil by the water-culture method, D. R. Hoagland and D. I. Arnon (*California Sta., 1938, pp. 16*).—This mimeographed circular is presented in two parts—(1) general discussion and (2) procedures for growing plants by the water-culture method.

Results with rapid soil tests used on the plots of a vegetable fertilizer experiment, J. D. Hartman (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 463–470, figs. 5*).—Having noted that under ordinary Long Island field conditions rapid soil tests may show no marked difference in available nutrients between apparently deficient soils and those which by crop response appear to have ample nutrients, the author ran a series of tests on the plats of a vegetable fertilizer experiment under way at the Long Island Vegetable Research Farm, Riverhead. Although the standard errors were usually higher when plats were grouped

according to soil test results than when grouped according to known fertilizer treatments, the differences were not great. A large difference in yield between good and poor areas in a field appeared necessary before any nutrient difference shown by a single pair of tests results could be used to account for the same. Under the existing conditions, if differences in yield were about 22,000 lb. per acre for lettuce, about 5,700 lb. for fertilized spinach, and 3,000 lb. for unfertilized spinach, if quantities of one nutrient were definitely different, and if other test results and observed conditions were the same, it was probable (30 to 1) that the difference in yield was due to differences in nutrient levels. Among undetermined soil variables probably accounting in part for yield discrepancies were boron and manganese contents, moisture-supplying power, aeration, oxidation-reduction potential, soil texture, and the depth of the surface soil.

Physiological factors associated with the fruiting of the bush lima bean, F. S. ANDREWS. (S. C. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 498–501*).—Following earlier studies (E. S. R., 77, p. 335) which indicated that the greater yielding capacity of Henderson as compared with Fordhook may be accounted for by the greater photosynthetic capacity of the former, in 1936 the two varieties as grown at Clemson in the open and under cloth shades and at Highlands, N. C., in the open were compared. For each variety, yields, chlorophyll content, and stomatal activity were significantly greater at Highlands in the open and at Clemson in the shade. In all cases, Henderson had greater chlorophyll content than did Fordhook. At Clemson the differences between open and shaded plants were much greater in the afternoon than in the morning. Apparently, Fordhook, with its lesser chlorophyll content and thinner leaves when grown in the open, benefited more from shading than did Henderson. At Clemson under shade both varieties had approximately the same leaf thickness and length of palisade cells. The uniformly greater chlorophyll content of Henderson is believed to be a major reason for its wider adaptability.

Baby Fordhook, a new small, thick-seeded bush lima bean, R. MAGRUDER. (Ohio Expt. Sta.). (*Canner, 86 (1938), No. 8, pp. 18, 19, figs. 2*).—A description is presented of a new hybrid bush lima bean produced by crossing Fordhook and Henderson Bush varieties. Compared with Henderson Bush, the new variety is about 4 days later in reaching canning stage of maturity and is less uniform in ripening its pods. Compared with the Fordhook parent, the new variety has smaller foliage and smaller pods, but during two hot, dry summers in Maryland it produced from three to four times as many pods as Fordhook.

Effect of source of nitrate nitrogen and a mixture of minor plant nutrients on the growth of cabbage plants in pots, W. D. KIMBROUGH. (Ala. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 488–494, figs. 9*).—This is a report upon studies in which certain differences were noted in the growth of cabbage plants supplied with nitrate nitrogen from various sources, supplemented in some instances with minor plant nutrient mixtures.

Some factors associated with puffy-headed cabbage, J. C. MILLER. (La. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 495–497, fig. 1*).—Stating that puffy heads cause serious economic losses in the southern truck crop region, especially during midwinter and very early spring, the author reports observations on the puffiness in several varieties of cabbage. The percentages of puffy heads ranged from 9.7 in Louisiana Copenhagen, a strain selected for resistance to this character, to 38.6 in All-Head-Early. Methods of detecting puffy head are discussed with the comment that both environment and heredity are concerned. Incomplete dominance of the internal head characters was observed in the crosses between firm and puffy-head strains.

Some cellular changes in celery during freezing and frost hardening, R. H. White-Stevens. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 570–576, figs. 4*).—Observations on the tissue structure of young Golden Plume celery plants, grown in the greenhouse and subjected to different temperature treatments corresponding to the hardening processes in the field, showed that submission to low temperature changes certain of the cellular characteristics, such as permeability of the plasma membrane to water, etc. As a result of the studies, the author suggests that celery plants in the field when subjected previously to comparatively low temperatures may withstand slight frosts, while those that have been grown at continuously high temperatures are not resistant and should be harvested prior to frost.

The statistical analysis of a spacing experiment with sweet corn, A. N. Watson and R. L. Davis. (P. R. Expt. Sta.). (*Jour. Amer. Soc. Agron., 30 (1938), No. 1, pp. 10–17, figs. 3*).—The closest spacing of plants utilized, 2.79 sq. ft. of soil per plant, gave the highest yield of shelled corn and fodder. Increasing numbers of marketable ears were recorded as the area per plant became smaller, but this was followed by a significant decrease in average weight of marketable ears when the area was less than 3.41 sq. ft. per plant. The planting of corn on ridges 4 in. wide at the top and 9 in. at the bottom resulted in less lodged corn after high winds than was the case with narrow ridges. Diameter of the lowest internode of the cornstalks increased with increase in soil area up to 3.95 sq. ft. per plant.

Results of 1937 hybrid sweet corn trials in Wisconsin, I, II, N. P. Neal. (Wis. Expt. Sta.). (*Canner, 85 (1937), Nos. 23, pp. 14–16; 24, pp. 18, 20, 22*).—In the summer of 1937, 12 carefully chosen strains were tested in comparison with open-pollinated Golden Bantam and Country Gentleman varieties. It was found that hybrid strains out-yielded open-pollinated strains, both in fodder production and in the quantity of corn packed. The quality of the processed corn from hybrids was superior to that of the open-pollinated varieties, largely because of the greater uniformity of maturity. Marked differences both in yield and quality were noted among individual hybrid strains, suggesting the importance of trials to evaluate new strains before they are placed under extended commercial use. On the whole, top-cross hybrids were not as desirable as the true hybrids produced by crossing selected and tested inbred lines. Under certain seasonal conditions a lack of uniformity may be actually an asset, since ripening ranges over a longer period and is more likely to strike favorable weather. There appeared to be a particular lack of white hybrid strains that are adapted to Wisconsin. The importance of careful harvesting and drying of sweet corns was indicated in the variable results obtained in the same varieties obtained from different sources.

Wilt resistant sweet corn hybrids, C. M. Haenseler. (N. J. Expt. Stas.). (*N. J. State Hort. Soc. News, 18 (1937), No. 6, p. 951*).—Extensive tests in 1937 with a large number of wilt-resistant varieties and hybrids showed that Golden Cross Bantam rated at the top, both from the standpoint of yield and disease resistance. Bloomsdale Golden and Bloomcross appeared promising, and of the Whipple Early type Whipcross 39 was outstanding. Most of the yellow corns that are earlier than Golden Cross Bantam are extremely susceptible to wilt, the only exception in 1937 being Marcross 13–6.

Resistance to corn earworm injury in the Charleston, South Carolina, area, C. F. Poole. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 566–569*).—Experiments conducted at the Regional Vegetable Breeding Laboratory, with a large number of strains of sweet and field corn showed marked differences in resistance to earworm attack and indicated that such resistance

may be of genetic nature. Tuxpan and Davis Prolific, two southern dent varieties, repeated the excellent showing made in California tests in 1935, and Purdue 51, a variety hitherto unknown to possess earworm resistance, displayed a surprising degree of resistance. Observations on seedlings of Tuxpan and Davis Prolific showed a marked tendency for these varieties to transmit resistance to their progenies. Tuxpan, Davis Prolific, Papago, Mexican June, and Oregon Evergreen proved to be outstanding parents for securing earworm resistance.

Production of water cress, J. H. Beattie (*U. S. Dept. Agr. Leaflet 134 (1938), pp. 4, fig. 1*).—This pamphlet contains brief cultural and marketing information.

The vegetables of New York, Vol. I, pt. 4: The cucurbits, W. T. Tapley, W. D. Enzie, and G. P. Van Eseltine (*New York State Sta., 1937, pp. [5]+131, pls. 49*).—This, the fourth of a series (E. S. R., 72, p. 329), presents in the same general manner an account of the botany and history of the cucurbits cultivated in the Northern States and full horticultural descriptions of all the present-day and some of the older varieties of squashes, pumpkins, muskmelons, and cucumbers, with their history and development. The illustrations are in color.

The germination of lettuce seed stimulated by chemical treatment, R. C. Thompson and W. J. Kosar (*Science, 87 (1938), No. 2253, pp. 218, 219*).—At Beltsville, Md., seed of Grand Rapids and Hubbard Market lettuce which germinated poorly on damp filter paper in Petri dishes held at 25° C. (77° F.) in darkness germinated very well when the paper in the dishes was moistened with 0.5 percent solutions of thiourea, allyl thiourea, ammonium thiocyanate, and potassium thiocyanate. The optimum concentration was found to be near 0.5 percent. Urea, sodium nitrate, ammonium sulfate, potassium ferricyanide, potassium ferrocyanide, and calcium sulfate gave no significant stimulus, and some of them retarded germination. Thiourea was the only chemical that was effective on all lots of dormant seeds tested, showing 94 percent germination for the 0.5 percent concentration, whereas the most effective concentration of urea, 0.2 percent, showed only 15 percent. The authors point out that thiourea differs from urea simply in its sulfur content but that sulfur itself was not the stimulating factor, since calcium sulfate, ammonium sulfate, and other sulfur-containing compounds had no stimulating and sometimes detrimental influences.

***The effect of controlled photoperiod on the production of seed stalks* in eight varieties of spinach,** R. Magruder and H. A. Allard. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 502–506*).—Of eight varieties of spinach grown at Arlington Farm, Va., under different hours of light, only a portion of the plants of Virginia Savoy and Hollandia produced seed stalks with 8- and 10-hr. photoperiods. A 12-hr. photoperiod was insufficient for the production of seed stalks in the Long Standing Bloomsdale, Juliana, and King of Denmark varieties. With 12 hr. of light only a portion of the plants of Bloomsdale Savoy and Viroflay were able to produce seed stalks, as compared with 100 percent in Virginia Savoy and Hollandia. King of Denmark was the only variety that failed to produce 100 percent of seed stalks with 14 hr. of light. An increase in length of day from 8 to 10, to 12, and to 14 hr. resulted in a decrease in the number of days required for the appearance of the first seed stalks or of the number of days required for all plants to become seeders. Fourteen hr. of daylight was as effective as the longer normal day length for producing seed stalks in Virginia Savoy, Bloomsdale Savoy, Long Standing Bloomsdale, Hollandia, and Viroflay varieties.

Whole salad tomatoes, W. T. Tapley. (N. Y. State Expt. Sta.). (*Canning Age, 19 (1938), No. 2, pp. 65, 66, figs. 3*).—Herein is presented a brief report on certain varieties of the Italian-type tomatoes which are considered promis-

ing because of high yields, the small size of the fruits, and their intense color. They are deemed particularly desirable as whole fruits for salads.

Carbon dioxide assimilation of the tomato, E. P. Christopher. (R. I. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 527–535, figs. 6*).—In work with tomato plants of the Waltham Greenhouse strain planted in the greenhouse in the autumn, carbon dioxide assimilation in tomato leaves tended to follow a rather definite pattern. The assimilation rate did not follow light intensity closely, and a closer relationship was observed between the transpiration rate and the weather than between carbon dioxide assimilation and the weather. Spraying leaves with bordeaux mixture 4–4–50 apparently did not influence carbon dioxide assimilation under the conditions of the experiment. Copper sulfate solution caused some visible spotting of leaves and a marked reduction in carbon dioxide intake. A lime solution failed to reduce carbon dioxide assimilation.

Growing tomatoes with chemical fertilizers, V. A. Tiedjens. (N. J. Expt. Stas.). (*Better Crops With Plant Food, 21 (1937), No. 12, pp. 13–15, 44–47, figs. 3*).—A survey showed plant nutrient levels on a number of farms located in a county the soil of which is mostly of a sandy nature frequently to be too low in calcium, phosphorus, potash, organic matter, and nitrogen to support even a low yield of tomatoes or other vegetables. There was evidence that calcium and magnesium are as necessary as nitrogen, phosphorus, and potash for the development of a large tomato crop. Liming was found to increase yields as much as from 3 to 4 tons per acre when applied to lime-deficient soils. Because of the increased growth following liming, potash often became deficient. At least 1,500 lb. of a 5–8–7 fertilizer is needed for tomatoes on soils well supplied with calcium, and in some cases it may be advisable to increase the potash to 10 or 12 percent. The symptoms of potash, nitrogen, phosphorus, and calcium deficiencies in the tomato are described.

Flower structure and its relation to fruit setting in the tomato, F. S. Howlett. (Ohio Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 33 (1936), p. 526*).—In these studies it was evident that conditions inducing a mild deficiency of carbohydrate reserves caused an increase in the length of the pistil in practically all of 40 varieties under trial. However, there was a marked variation in varietal response, with those varieties exhibiting a comparatively slight change in pistil length setting more freely than did those manifesting maximum change in pistil length. Apparently, changes in length of pistil are concerned with the adaptability of different varieties to greenhouse culture and may be one of the frequent causes of failure in fruit setting.

Further studies of tomato defoliation, J. H. MacGillivray and R. W. Samson (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 523–526, figs. 2*).—Having reported in an earlier paper (E. S. R., 76, p. 476) that the age of plant and nutrition are factors affecting defoliation, as well as the importance of a large amount of available plant food late in the season, further studies were conducted to show the amount of food required by an acre of tomatoes in comparison with such crops as corn, wheat, or barley. The indications were that the tomato uses more nutrients than do the three crops cited, but attention is called to the different habit of development in the tomato and in the grain crops. The data indicated that 6.25 tons of ripe tomatoes remove 24.7 lb. of nitrogen, 8.4 lb. of phosphoric acid, and 39.9 lb. of potash from the soil. A 50-bu. corn crop and a 33-bu. wheat crop will each remove 74 lb. of nutrients. The percentage of nutrients removed by ripe tomatoes in comparison with the total amount of nutrients in the plants varied greatly from year to year. Some evidence was obtained that the composition of the tomato plant has an influence

on its susceptibility or resistance to *Septoria lycopersici*. In the greenhouse, well-nourished plants did not apparently suffer as great defoliation nor develop as much leaf infection as did starved plants.

Some studies on puffiness of tomatoes, J. B. CORNS. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 540–542*).—Studies on the effect of pollination practices upon puffing of Marglobe tomatoes grown in the greenhouse as a fall and winter crop showed that the type of puffing caused by a lack of seeds in the carpel was lowest in the lots most completely pollinated. Observations in the spring of 1936 on a puff-susceptible strain of the Texas Special variety indicated that the amount of puffing decreases if the fruits are left on the vines to ripen fully. Some data on Marglobe in the fall of 1936 gave further evidence that the degree of maturity is an important factor in the appearance of puffing. The fact that tomatoes in the South are picked largely in the mature green stage is believed to be an important cause of the large amount of puffing sometimes observed.

Factors affecting the keeping qualities of tomatoes in storage, V. E. IVERSON. (Mont. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 33 (1936), p. 539*).—Observations on the effect of certain treatments on the keeping quality of white ripe Bonny Best tomatoes indicated that covering the surface with a wax film materially reduced storage rots. All fruits in which the waxy coating remained intact kept in good condition over a period of 60 days at 5° C. (41° F.).

Certain elements affect the growth of turnips, M. B. DAVIS and W. FERGUSON (*Better Crops With Plant Food, 21 (1937), No. 12, pp. 6–10, 41, figs. 4*).—Investigations by the Central Experimental Farm, Ottawa, Canada, demonstrated the vital importance of a small amount of boron in the nutrient supply of the turnip. In time of application trials, it was evident that the presence of boron in the later stages of the turnip plant is of more benefit than in the early stages. The application of a boron solution to the foliage showed the turnip capable of absorbing this element through the leaves, but the treatment was not as effective or practical as feeding through the roots. For satisfactory development, the turnip requires an adequate supply of nitrogen and potash, with phosphorus occupying a secondary but important role. Calcium and magnesium maintain a less important position, but boron is fully as vital as nitrogen and potash, particularly in the later stages of growth.

Studies in incompatibility between stock and scion, with special reference to certain deciduous fruit trees, W. T. CHANG (*Jour. Pomol. and Hort. Sci., 15 (1938), No. 4, pp. 267–325, pls. 6, figs. 14*).—Studies at the East Malling Research Station, England, on a number of grafted and budded trees of pear, plum, peach, and cherry, all worked on clonal rootstocks, showed well-marked external manifestations of the degree of compatibility. With all incompatible combinations there was a low percentage of successful unions, premature autumn leaf-coloring and flower-bud formation, early defoliation, and dying back of young shoots. In incompatible combinations, defoliation started from the tops of the shoots in contrast to initial basal defoliation in compatible combinations. Incompatibility resulted in a delay in growth of new roots in the spring.

Anatomical observations showed an extensive accumulation of parenchymatous cells at the union. Compatible unions showed regular strands of medullary ray cells across the union about 4 weeks after budding. Incompatible unions were definitely weaker than the compatible and apparently developed obstructive features, as indicated in a slower flow of dyes and of water through the union. There was a heavy deposition of starch above the union in November. The

author concludes that the mechanical weakness and increasing obstruction at the union are the immediate causes of shoot and root decline in incompatible combinations.

A review of the literature on stock-scion incompatibility in fruit trees, with particular reference to pome and stone fruits, G. K. Argles (Imp. Bur. Fruit Prod. [East Malling, Kent], Tech. Commun. 9 (1937), pp. 115).—This is a thorough analysis of the present status of the subject, with constructive suggestions toward the orientation of future research.

Low temperature injury of fruit trees in central Washington during 1935–1936, F. L. Overley and E. L. Overholser. (Wash. Expt. Sta.). (Wash. State Hort. Assoc. Proc., 32 (1936), pp. 147–152).—Low temperatures occurring at Wenatchee in October and November 1935, followed by severe temperatures during the subsequent winter, caused material injury to fruit trees and led to an investigation. The injury was confined entirely to the above-ground portions of the trees and was divided into five types, dealing with the trunk, crotch, terminal growth, leaf bud, and fruit bud. Trunk injury was confined largely to trees from 3 to 10 yr. old. In some cases the young trees so affected developed severe bark cracks, and in many instances where the bark was tacked down before January recovery was facilitated. The Yellow Newtown, Golden Delicious, and Red Rome varieties of apples showed the greatest percentage of trunk injury. Young pears and sweet cherries were injured about as seriously as the apples, but apricot and peach trees tended to show less damage. Crotch injury was particularly serious with trees located in some of the higher valleys, and bud and twig injuries were also more frequent at the higher altitudes. Of the varieties examined for bud and twig injury, Rome, Spitzenburg, and Stayman showed the most difficulty. Evidence from pruning injured trees indicated the desirability of deferring pruning until after the severe winter period.

With regard to the Persian, or English, walnuts from central Washington, nearly all the trees were killed above ground.

Spraying program and pest control for fruit crops (Ohio Sta. Bul. 591 (1938), pp. 52, figs. 19; also Ohio Agr. Col. Ext. Bul. 128, rev. (1938), pp. 52, figs. 19).—This paper contains information with regard to the spraying of various trees and bush fruits, the nature and composition of spray materials, compatibility between materials, spraying procedure, spray injury, spray residues, dusting, and the nature and control of various troubles, such as fire blight, cedar rust, borers, and rodents combated by means other than spraying.

Spray residue removal studies of 1936, F. L. Overley, E. L. Overholser, and J. L. St. John. (Wash. Expt. Sta.). (Wash. State Hort. Assoc. Proc., 32 (1936), pp. 127–131).—It was found that the use of sprays that build up a heavy coverage of arsenic oxide late in the season results in difficult residue removal so that only the most effective washing practices are able to clean the apples satisfactorily. This was especially true where mineral oil was used in the second brood sprays with nearly any combination of materials. Although certain types of washing machinery and practices can remove heavy residues, the drastic washing procedures may impair the keeping quality by accelerating water loss and consequently induce decay or otherwise create an unattractive appearance. From the point of cleaning, the calcium arsenic sprays offered much promise because they contained no lead and, furthermore, the arsenic in the residue was more readily removed than was the case with lead arsenate. The experiments showed no relation between the rate of dehydration of the fruit and the quantity of residue remaining after washing. On the whole, the more

rigorous the washing process the better was the cleaning, but at the same time the greater the impairment of quality.

The "V" peaches, W. H. UPSHALL and J. R. VAN HAARLEM (*Ontario Dept. Agr. Bul. 389 (1938), pp. 7, figs. 6*).—Description and comments are presented on the distinguishing characteristics of the Vimy, Vedette, Valiant, Viceroy, and Veteran peaches.

Morphological studies of plum flowers, C. G. DAHL (*Alnarps Lantbr., Mejeri, o. Trädgårdsinst., Berät. Verks., 1934, pp. 1–93, figs. 127; also Meddel. Perm. Kom. Fruktodlingsförsök [Sweden], No. 38 (1935), pp. 93, figs. 127*).—Discussing the structure of the plum flower in general, the author presents photographic reproductions of the flowers of a large number of varieties, mostly of the *domestica* or European group, accompanied with brief technical descriptions based on actual measurements.

Refrigerated transportation of deciduous fruits from California, F. W. ALLEN. (Calif. Expt. Sta.). (*7. Cong. Internatl. Froid, La Haye-Amsterdam, 1936, Actes, vol. 4, pp. 512–526, figs. 6; also in Amer. Inst. Refrig. Proc., 25–26 (1936–37), pp. 79–88, figs. 6*).—A general picture of the transport of fruit in refrigerated cars, with information as to the effects of precooling, re-icing en route, and temperature on the condition of the fruit at the time of reaching the market, and upon the economics of refrigeration treatments and similar matters.

A study of the technique of variety trials, as illustrated by the comparative yields of four black currant varieties grown in three different localities, T. N. HOBLYN and J. L. EDGAR (*Jour. Pomol. and Hort. Sci., 15 (1938), No. 4, pp. 326–337, fig. 1*).—An analytical study of 5 years' yield data on four varieties of black currants planted at Wisley, East Malling, and Long Ashton, England, showed that the experimental design used, namely, six 4×4 Latin squares with a four-bush plat as the experimental unit, gave accurate results. Large differences were shown, not only between the gross varietal yields at the three stations, but also in the response at individual stations. The authors suggest that whereas from three to four 4×4 Latin squares would be necessary for reasonable accuracy at a single station, two similar squares would be ample if the experiment were repeated at two or three stations.

What climate does: The relation of weather to the composition of grapes and wine, [I], II, A. J. WINKLER and M. A. AMERINE. (Calif. Expt. Sta.). (*Wine Rev., 5 (1937), Nos. 6, pp. 9–11, fig. 1; 7, pp. 9–11, 16*).—Comparative studies of the composition of grapes and the resulting wine made over a 2-yr. period showed definitely that the climatic conditions under which grapes are grown may influence composition, not only by direct effect of excessive heat but also indirectly through variation in size of the crop or on the control of pests and organisms. There was a notable effect of climate on the percentage of sugar and through the sugar on the quality. Varieties differed in their response to hot weather, for example, the Petite Sirah suffered severely from extremely hot weather. It is suggested that in seasons of extremely high temperature early picking of the fruit might be a wise procedure.

Rooting avocado cuttings, E. R. EGGERS and F. F. HALMA. (Univ. Calif.). (*Calif. Avocado Assoc. Yearbook, 1937, pp. 121–125, figs. 6*).—At Los Angeles cuttings taken at different periods from a Mexican seedling, from Fuerte, and from Nabal were planted in a propagating frame with bottom heat. In all the tests the cuttings of Mexican seedlings rooted most rapidly, with percentages ranging from 13 to 85. The Nabal cuttings failed to root at all, although in some cases they produced callus profusely and remained in sound condition for many months. The only visible difference between cuttings and seedlings is that the former do not form taproots.

Germinating power of avocado seed from frost-injured fruit, E. R. Eggers. (Calif. Expt. Sta.). (*Calif. Avocado Assoc. Yearbook, 1937, p. 120*).—Seed taken from frost-injured Fuerte fruits which were previously divided into four groups, namely, slightly injured, moderately injured, severely injured, and completely frozen, were germinated with the result that full germination was secured in all lots except the completely frozen, and even in this case 58 percent germination was secured.

Recovery of avocado trees from the January 1937 freeze, F. F. Halma and A. Courtney. (Calif. Expt. Sta.). (*Calif. Avocado Assoc. Yearbook, 1937, pp. 94, 95, 96, 97, figs. 2*).—Observations showed marked differences between varieties in their ability to recover following severe freezing injury. Fuerte was one of the hardiest varieties in the group under observation. Top grafting of injured trees with scions from vigorous plants was found the most effective measure in promoting rapid recovery.

pH for healthy growth in citrus, A. R. C. Haas (Calif. Expt. Sta.). (*Calif. Citrogr., 23 (1938), No. 4, pp. 158, 176, 178, 180, 181, figs. 4*).—Observations at the Citrus Experiment Station, on the growth of Navel and Valencia orange trees supplied with nutrient solutions, with calcium nitrate added subsequently from time to time, indicated that citrus trees can grow under alkaline conditions when the nitrogen is added in the form of calcium nitrate. The active growth of citrus roots under such conditions was accompanied by a reduction in the degree of alkalinity. Apparently, actively growing citrus fruits create fluctuations in the pH of the solutions with which they come in contact. Rotting of roots occurred when the pH of the solution remained close to pH 8.1, even when an abundant supply of air was run continuously into the solutions. Without renewal or exchange of the cultural solution and without renewal of dead and disintegrating roots, vigorous growth from the portions of the root system still alive was quickly induced by the addition of acid to the cultural solution.

Germination of flower seeds stored for ten years in the California State seed laboratory, W. L. Goss (*Calif. Dept. Agr. Bul. 26 (1937), No. 3, pp. 326–333*).—Using as material 64 samples of flower seeds representing 30 genera, tests were conducted on viability over a 10-yr. period. As was expected, the genera behaved differently, some showing little loss of germination for years and then failing rapidly. The average length of time the samples retained planting value was 6 yr. The germination obtained in the first test was not an accurate indication of the longevity, since several samples with a low original test retained 50 percent or more of their original vitality for the full 10 yr. Eighty-six percent of all the samples retained 50 percent or more of their original vitality for 3 yr. or more, 66 percent for 5 yr. or more, and 25 percent for 10 yr. or more. It is suggested that stored flower seeds should be tested for germination at least once each year, preferably just prior to the planting season. Among well-known species the asters, represented by 6 samples, all failed after the third year, while 5 of the 6 samples of zinnia lasted the full 10 yr.

Shade tree law in Massachusetts, E. T. Simoneau (*Massachusetts Sta. Bul. 349 (1938), pp. 19*).—This is a treatise on shade tree law presented at a course for tree wardens and town foresters at the Massachusetts State College.

Rubber content and habits of a second desert milkweed (Asclepias erosa) of southern California and Arizona, R. E. Beckett, R. S. Stitt, and E. N. Duncan (*U. S. Dept. Agr., Tech. Bul. 604 (1938), pp. 12, figs. 3*).—Continuing earlier work (E. S. R., 74, p. 207), the rubber content of the leaves of wild

plants collected in Yuma County, Ariz., was found to range from 2.45 to 13.06 percent, with an average of 8.57 percent. The leaves represented over 50 percent of the dry weight of the plants and contained approximately 90 percent of the rubber. Leaves stored in paper bags in a dry room under normal light conditions were kept for from 18 to 20 mo. without appreciable loss in their rubber content. In analyses of the leaves of several species, *A. crosa* ranked highest in rubber content. Progenies raised from seeds taken from mother plants selected for high, medium, and low rubber yields tended, in general, to follow their parents, with definite indications that full rubber-producing capacity is reached early in the life of the plants. Information is presented on the environmental requirements and habits of growth, with the comment that plants attain their maximum rubber content in autumn. Seed germinated readily and the seedlings grew rapidly, attaining an average height of 14.8 in. the first season.

FORESTRY

The work of the U. S. Forest Service (*U. S. Dept. Agr., Misc. Pub. 290 (1938), pp. 40, figs. 30*).—Superseding an earlier publication (E. S. R., 47, p. 147), this discusses the organization and management of the national forests, State and private cooperation, forest and range research, the C. C. C. and other emergency activities, and the organization of the Forest Service.

Forest farming (*U. S. Dept. Agr., Farmers' Bul. 1794 (1938), pp. [2]+18, figs. 21*).—Information of a general nature is presented on the importance and extent of farm forestry, with emphasis on the role of trees in providing farm fuel and annual income from sales of wood, in beautification of the farmstead, in the reduction of erosion and wind damage, etc.

The effect of seed origin on drought resistance of green ash in the Prairie-Plains States, L. J. Meuli and H. L. Shirley (*Jour. Forestry, 35 (1937), No. 11, pp. 1060–1062, fig. 1*).—Seedlings grown from seed from 83 green ash trees representing 39 separate locations were, after from 6 to 12 mo. in a greenhouse, submitted to an artificial drought created by control of temperature, relative humidity, and wind velocity. The results confirmed earlier findings, namely, that drought resistance of the green ash in the Prairie-Plains region increases from south to north and from east to west. Seed from the northwestern portion produced the most drought-resistant plants. Differences were also noted in the size of seedlings, color of foliage, and time of growth resumption in the spring, suggesting the existence of climatic races within the species.

Effect of locust trees upon the available mineral nutrients of the soil, W. H. Garman and F. G. Merkle (*Jour. Amer. Soc. Agron., 30 (1938), No. 2, pp. 122–124*).—Observing the development of bluegrass in rings beneath locust saplings planted on a steep, barren road embankment, the Pennsylvania Experiment Station sampled the soil in the 2 to 5 in. zone beneath the trees and some feet distant. The pH of the soil beneath the locust trunks had risen from 5 to 5.5 to near neutrality. The amounts of active calcium, magnesium, and potassium were significantly higher near the trees, suggesting that the decomposing locust leaves had enriched the soil. In four of five pairs, nitrates were higher near the trees.

Comparative rates of germination and germination percentage of native and introduced pine seed, and the relation of this data to nursery practice in Kwangtung, D. D. Stevenson (*Lingnan Sci. Jour., 16 (1937), No. 4, pp. 573–*

577, fig. 1; Chin. abs., p. 577).—Studies at Lingnan University, China, with seed of three species of American pines, namely, *Pinus caribaea*, *P. taeda*, and *P. echinata*, and also with the Chinese red pine, *P. massoniana*, showed the native Chinese species to have both a faster rate of germination and a higher germination percentage than did the American species. Rapid germination is said to be highly important during the spring season when heavy rains are apt to wash away seeds and when insect attacks are prevalent.

Effect of soil moisture on the rate of growth of longleaf and slash pine seedlings, L. J. Pessin (*Plant Physiol., 13 (1938), No. 1, pp. 179–189, fig. 1*).—Observations on plants grown in the greenhouse from April to October in sealed containers showed the best development in both longleaf and slash pine *in soil containing an abundance of, but not completely saturated with, water.* In these lots the seedlings had a high transpiration rate and absorbed much water. The rate of transpiration was practically the same for slash and longleaf pine of the same age and under equal moisture levels. Transpiration rate was lowest in very dry soil, highest in moist soil, and low again in saturated soil. Under moist conditions favorable for growth mycorhizas were produced abundantly. The water requirements were generally higher for slash pine under moist-to-wet conditions than for longleaf pine. Apparently, slash pine seedlings required more moisture to build a unit of dry matter than did longleaf pine.

Recovery processes of ponderosa pine reproduction following injury to young annual growth, C. K. Cooperrider (*Plant Physiol., 13 (1938), No. 1, pp. 5–27, figs. 13*).—Stating that in the plateau region of northern Arizona there is considerable browsing of pine by animals and also tip moth injury, the author discusses observations on the recovery of ponderosa pine from such injury. The replacement of lost current growths through the development of substitute buds or shoots proved to be common, and it was observed that there are several different processes whereby ponderosa pine develops substitute growths. These recovery processes differed according to the type of injured wood. Repeated browsing and tip moth injury caused young pines to become temporarily as bushy as hedge plants. Following release from injury, the hedged plants grew exceptionally large body shoots, and finally a substitute shoot assumed the leadership. As the new leader became branched, the hedged branches below ceased functioning and died. Were it not for this ability to form new buds, browsing and tip moths would prevent reforestation in certain areas.

Rapid growth hazards usefulness of southern pine, A. Koehler. (U. S. D. A.). (*Jour. Forestry, 36 (1938), No. 2, pp. 153–159, figs. 4*).—Studies by the Forest Products Laboratory of lumber from rapidly grown southern pine trees showed that in general the specific gravity of such wood was considerably less than that of slower-grown material of the same species. Of some 1,500 specimens, 9.5 in. long and about 1 in. wide radially, which were cut from slowly and rapidly grown wood from various parts of 68 loblolly and 15 slash pines, a maximum longitudinal shrinkage of about 2 percent was found in both species in wood having in each case slightly over two rings per inch. This was about 17 times the normal longitudinal shrinkage and was equivalent to 3.75 in. in a 16-ft. board. Even more important than longitudinal shrinkage was the tendency for rapidly grown wood to crook and bow when attached by growth or otherwise to normal wood. The advantage of low specific gravity—such as lightness, easy working, low transverse shrinkage, and low heat conductivity—was more than offset by the unfavorable factors mentioned.

DISEASES OF PLANTS

Diseases of plants in the United States in 1936, compiled by H. A. Edson and J. I. Wood (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 1937, Sup. 103, pp. 123–244, figs. 20*).—This annual summary includes data on diseases of cereal, forage and cover, fruit, nut, vegetable, sugar, and special crops, trees, ornamentals, and miscellaneous plants. The most noticeable fact regarding disease incidence in 1936 is said to be its contrast with the preceding year—due to the disastrous drought of 1936. The most outstanding individual disease events as noted are the arrival of blister rust in California, and the collection for the first time east of the Mississippi River (one isolated exception) of the sugar beet leafhopper in southern Illinois in association with diseased horseradish showing symptoms suggestive of curly top. Others mentioned are the discovery of *Phymatotrichum* root rot in Nevada, the spread of tobacco downy mildew to Kentucky, and the sudden outbreaks of bean rust in several States. The summary includes data on weather conditions.

The Plant Disease Reporter, April 15 and May 1, 1938 (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 22 (1938), Nos. 7, pp. 107–120, figs. 2; 8, pp. 121–143, figs. 2*).—The following items are of interest:

No. 7.—Inspect strawberry fields now for the red-stele (*Phytophthora*) root disease, by J. B. Demaree and H. F. Bain; northern type of strawberry dwarf (*Aphelenchoides fragariae*) serious on the Chesapeake Peninsula, by G. M. Darrow and J. B. Demaree; reports on development of the apple scab fungus for Rhode Island, New York, and Wisconsin; freezing injury to fruit buds at Ithaca, New York, by L. H. MacDaniels; stem rust on wheat kernels, by R. J. Haskell and A. G. Johnson; wheat diseases observed in Oklahoma, by K. S. Chester; observations on tobacco downy mildew in Georgia and the Carolinas, by E. E. Clayton; more recent reports on tobacco downy mildew for South Carolina, southeastern North Carolina, and north-central North Carolina; and brief notes on plant diseases, including peach leaf curl in Kentucky, gray mold (*Botrytis* sp.) rot of stored apples in Delaware, early appearance of crown rust on oats in Texas, *Sclerotinia* stem rot of alfalfa in Kentucky, and lettuce anthracnose (*Marssonina panattoniana*) in California.

No. 8.—Notes on vegetable diseases in the lower Rio Grande Valley in the spring of 1938, by G. H. Godfrey; onion downy mildew (*Peronospora destructor*) appears in New York (earliest seasonal record for State), by A. G. Newhall; lettuce anthracnose (*Marssonina panattoniana*) in California, by M. W. Gardner and J. B. Kendrick; a note on hop anthracnose, by J. A. Stevenson; tobacco downy mildew (blue mold) (*Peronospora tabacina*) development in North Carolina, by L. Shaw; downy mildew of tobacco appears in Virginia, Maryland, and Tennessee; additional reports (South Carolina and North Carolina) on tobacco downy mildew; tobacco wildfire (*Bacterium tabacum*) in Maryland; fluctuations in the incidence of corn ear rots in the Corn Belt, 1935–37, by N. E. Stevens; leaf rust (*Puccinia rubigo-vera tritici*) damage to Oklahoma wheat, by K. S. Chester; condition of small grains in west Texas: notes on freezing injury and occurrence of rusts, by I. M. Atkins; flax rust (*Melampsora lini*) in Texas, by G. E. Altstatt; fruit diseases reported from New York State; other reports (Massachusetts, Rhode Island, and Maryland) on apple scab; blister rust infection on *Pinus albicaulis* in the Northwest, by T. W. Childs, J. L. Bedwell, and G. H. Englerth; sycamore disease (bark-inhabiting fungus?) in Louisiana, and *Fomes annosus* on *Pinus palustris* in Louisiana, both by P. V. Siggers; a field survey (including disease notes) of some of the bean-growing sections of Michi-

gan—fall of 1937, by F. Hedges; and brief notes on onion mosaic in Kentucky, diseases of lettuce on Long Island, and cereal diseases in California.

Index to Supplements 98–103, N. W. Nance (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 1937, Sup. 104, pp. 245–263*).

Notes on fungi from the lower Mississippi Valley, L. O. Overholts. (Pa. Expt. Sta.). (*Bul. Torrey Bot. Club, 65 (1938), No. 3, pp. 167–180, figs. 13*).—This contribution reports on about 500 collections of fungi (Ascomycetes, Fungi Imperfecti, and Basidiomycetes) representing approximately 200 species, mainly of wood-inhabiting forms, made during a reconnaissance survey (1931) of timber decays and their causal fungi as they occurred in the lower Mississippi Valley. Included are the following: *Odontia brunnescens* n. sp., *Radulum vinosum* n. sp., *Polyporus radiatus cephalanthi* n. var., and *Poria flaccida* n. sp.

British stem- and leaf-fungi (Coelomycetes): A contribution to our knowledge of the Fungi Imperfecti belonging to the Sphaeropsidales and the Melanconiales.—II, Sphaeropsidales, comprising Sphaerioideae, with coloured spores; Nectrioideae, Excipulaceae, and Leptostromataceae; and Melanconiales, W. B. Grove (*Cambridge, Eng.: Univ. Press, 1937 vol. 2, pp. IX+[2]+406+[1], figs. [102]*).—This second volume of the work previously noted (E. S. R., 74, p. 787) includes the following new taxonomy, the figures in parentheses indicating the number of new species for the genera cited: *Sclerozythia* (Nectrioideae) n. gen., with *S. brassicae* n. sp.; *Apomelasmia* (Leptostromataceae) n. gen., with *A. urticae* n. comb.; *Rhodesia* (Melanconiales) n. gen., with *R. subtecta* n. comb.; and new species in *Rhabdospora* (2); *Microdiplodia* (3); *Camarosporium* (3); *Cytosporium* (1); *Sphaeronaemella* (1), *Fusidomus* (1), *Leptothyrium* (1), *Labrella* (1), *Leptostromella* (1), *Pycnothyrium* (1), *Myxosporium* (2), *Pestalozinna* (1), *Cryptosporium* (1), and *Libertella* (1). Addenda to volume I, Latin diagnoses of new genera and species, indexes of Ascomycetes, hosts and binomial fungus names, and a list of the most important authorities with their usual abbreviations conclude the monograph.

Pectase activity of certain microorganisms, H. H. Thornberry. (Ky. Expt. Sta.). (*Phytopathology, 28 (1938), No. 3, pp. 202–205*).—The pectase activity of certain plant pathogens (*Phytomonas mori* [=*Bacterium mori*], *P. tabaca* [=*B. tabacum*], *P. angulata* [=*B. angulatum*], an undetermined bacterium, *Fusarium* sp. from tobacco, *Sclerotium bataticola*, *Sclerotinia sclerotiorum*, *S. trifoliorum*, *Rhizoctonia* sp., *Thielaviopsis basicola*), and of an extract from cured tobacco was assayed by a method in which a known substrate (calcium salt of monomethylester of tartaric acid) was used instead of sections of plant tissues. The precipitate (calcium salt of tartaric acid) formed indicates the amount of hydrolysis, which was slight from the solutions of four cultures of bacteria, five of *Fusarium*, and one of *Thielaviopsis*. There was no visible action from two cultures of *Fusarium* and one of *Rhizoctonia*. Activity was fair with the cultures of *Sclerotinia* and tobacco extract, moderate with a freshly isolated culture of *Fusarium*, one *Sclerotium*, and one *Thielaviopsis*, and marked with one *Sclerotium* and one *Thielaviopsis*. The macerated mycelial masses of *Fusarium*, *Sclerotium*, and *Thielaviopsis* were fair, moderate, and marked, respectively. A criticism of the plant tissue methods is offered, in that possible activators secreted by the pathogen may activate inactive enzymes present in the test tissue.

Newer biological aspects of protein chemistry, M. Bergmann and C. Niemann (*Science, 86 (1937), No. 2226, pp. 187–190*).—This paper discusses protein molecules with regard to their chemical structures and their relationships with the life processes, including the present concept of protein synthesis in vivo and the role of the intracellular proteinases. It is concluded that "there must exist

proteinases which have the ability to synthesize replicas of their own structural pattern and therefore are able to 'multiply' in suitable surroundings. Such a type of proteinase when placed in the presence of a suitable host organism would cause the continuous production of foreign protein. It is evident that this property is similar to that described by Stanley for the tobacco mosaic virus, and it would appear desirable to investigate this and other viruses for possible proteinase activity."

The truth of the matter: W. M. Stanley and the filtrable virus, T. S. HARDING (*Med. Rec., 246 (1937), No. 9, pp. 22, 24, 27, 38*).—This is a critical review of Stanley's work on the tobacco mosaic virus, and of the earlier studies by Woods (E. S. R., 12, p. 216), Duggar and Armstrong (E. S. R., 50, p. 840), Vinson and Petre (E. S. R., 65, p. 843), and others which paved the way to the final successful crystallization and purification of the virus protein. Reference is also made to recent work by Bergmann and Niemann (see above) through which it appears an "offending protein may arise within the cell due to deranged metabolism."

The nature of viruses, T. E. RAWLINS and W. N. TAKAHASHI. (Univ. Calif.). (*Science, 87 (1938), No. 2255, pp. 255, 256*).—The authors discuss recent evidence appearing to favor the animate nature of viruses, in the hope that it may stimulate further research in this field rather than that it may enable the reader to reach final conclusions.

The separation of plant viruses by chemical inactivation, W. B. ALLINGTON. (Wis. Expt. Sta.). (*Science, 87 (1938), No. 2255, p. 263*).—This preliminary note reports the successful separation of some combined viruses by treatment of plant extracts containing them with chemicals which have proved to be specific inactivators for certain viruses. For example, it was found that cucumber mosaic virus could withstand higher concentrations of $AgNO_3$ and $HgCl_2$ than could the potato ring spot virus. Conversely, the latter virus could withstand higher concentrations of potassium permanganate, Li_2CO_3, and $CuSO_4$. H-ion concentration did not appear to be correlated with the inactivation in the tests reported.

Notice to members of the American Phytopathological Society concerning description and nomenclature of plant viruses (*Phytopathology, 28 (1938), No. 3, pp. 230, 231*).—This note presents a resolution by the Council of the American Phytopathological Society expressing to the International Committee on Description and Nomenclature of Plant Viruses appreciation for their work and recommending the full cooperation of individual workers in refraining from adopting any new system until this Committee has had opportunity to make its next report. Criticisms and suggestions are invited.

Cytology of leaves affected with little-leaf, H. S. REED. (Univ. Calif.). (*Amer. Jour. Bot., 25 (1938), No. 3, pp. 174–186, figs. 17*).—As shown in these studies, the disease appears to promote cell growth rather than multiplication in the palisade parenchyma. In tomatoes there was atrophy of the mesophyll. The lack of differentiation resulted in an essentially juvenile or, perhaps, xerophytic leaf structure. Little leaf is characterized by the destruction or more or less complete inhibition of development of the chloroplasts, cells receiving the strongest illumination generally showing the greatest plastid injury. Hypoplastic conditions were often associated with agglutination of the plastids in the polar region of the plastid cells, with subsequent vacuolization and shrinkage of the plastids. Vaculoated or shrunken plastids seldom contained starch (except for peach). The factors producing plastid derangement often seemed to be localized. Associated lytic factors frequently destroyed most of the cell contents in more or less extensive areas. The nonliving

cell inclusions served as valuable indicators of the amount, if not of the nature, of the induced derangement. Phenolic substances in the cell vacuoles were a general characteristic in certain leaves (e. g., apricot). However, the leaf cells of corn were free from these substances, while in buckwheat the leaf cells contained them only in association with marked little-leaf symptoms. Observations seemed to indicate that phenolic substances may occur in healthy as well as in affected leaves, leading to the conclusion that the differences noted may be in degree rather than in kind. Differences in light intensity (and, by implication, photosynthesis) appeared to induce profound alterations in the tannins. With seasonal growth changes, these substances tended to disappear from healthy leaf cells, but not from those with little leaf. There was no evidence of toxic effects. It seemed more probable that the free phenolic substances may participate in the leaf metabolism, and that those adsorbed on colloidal substrates do not participate in cellular metabolism. Sterinoplasts and gums in affected leaf cells were associated with other symptoms of hypoplasia.

On speculative bases, it seems that zinc salts may catalyze oxidation processes in the cells, and in their absence biochemical reactions may run the other way. Tannins may further impede the oxidation processes. The combined effects may account for many of the leaf-cell derangements described.

The fibrovascular system is also affected by little leaf. In peach, apricot, etc., the endodermal cells were replete with phenolic substances, which, however, apparently had no great tendency to diffuse. In the endodermal cells of mature or senescent peach and apricot leaves plant gums may occur. However, considering the microscopical structure of the entire leaf, the fibrovascular elements suffered less disorganization by the disease than the cells of the palisade and mesophyll. The cause of the derangement in affected leaves is thus believed to be associated with metabolism rather than with conduction.

Building up virulence in Phytophthora infestans, D. Reddick and W. Mills (Cornell Univ.). (*Amer. Potato Jour., 15 (1938), No. 2, pp. 29–34*).—The virulence of *P. infestans* was increased by resistant-variety passage to a point at which certain hybrids ordinarily immune became severely blighted. A similar case of build-up in virulence was also observed to have arisen spontaneously. However, a gap was found which has not been bridged either spontaneously or artificially, since many hybrids still exist which give no reaction whatever to inoculation with strains of any virulence. Speculative discussions follow regarding the case of apparent loss of resistance by the variety Champion in Ireland, the potato-tomato blight situation in North America, and the question of biological specialization in *P. infestans*.

Tannic compounds in leaf cells, H. S. Reed. (Univ. Calif.). (*Chron. Bot., 4 (1938), No. 1, pp. 8, 9*).—This note refers to the association of tannic compounds in the cells of leaves, buds, and roots of plants affected with little leaf (rosette) disease. "It seems logical to assume that the tannic compounds found in these abnormal cells represent materials homologous with carbohydrate[s] which could be used, though less efficiently, in metabolism. In the cells whose metabolism has been altered by the little leaf disease, these compounds may have been produced in excess."

Plant-disease control by spraying, J. O. Andes (*Tennessee Sta. Bul. 164 (1938), pp. 47, figs. 19*).—This contribution presents information derived in part from local observations and tests with regard to various types of sprayers and equipment used for plant disease control. The advantages of stationary sprayers are noted, and local field tests are reported as indicating the multiple-nozzle rods and high-pressure pumps to be the most effective. The funda-

mentals of spraying and the effects of weather conditions on the size of equipment needed are discussed. It is indicated that the equipment must be of sufficient size to complete an application within three to four days.

Over a 12-yr. period, bordeaux mixture, lime-sulfur, and some elemental sulfurs have proved best for general fungicidal use, though a number of other materials have been found effective. Dusts were useful under some conditions as supplements or substitutes. Cold-pumped oil emulsion was satisfactory when made with power equipment. Directions for preparing and mixing spray materials are given, and special directions are included for spraying apples, peaches, plums, cherries, grapes, raspberries, potatoes, and tobacco. Spray schedules are provided with reference to disease susceptibility, spray injury, and adaptability to seasonal variations. Methods of removing spray materials are also included.

The Virginia spray program, R. H. Hurt. (Va. Expt. Sta.). (*Va. State Hort. Soc. Rpt., 42 (1937), pp. 91–95*).

Copper fungicides in Virginia, A. B. Groves. (Va. Expt. Sta.). (*Va. State Hort. Soc. Rpt., 42 (1937), pp. 70–74*).

Further determination of the carbohydrate-nitrogen relationship and carotene in leaf-hopper-yellowed and green alfalfa, H. W. Johnson (*Phytopathology, 28 (1938), No. 4, pp. 273–277, fig. 1*).—Continuing these studies (E. S. R., 72, p. 204), leaves yellowed by the leafhopper *Empoasca fabae*, whether from infested cages or cage-free, nondusted plats, proved to be higher in dry matter, reducing sugar, total sugar, and total acid-hydrolyzable substances but lower in total nitrogen than green alfalfa leaves from noninfested cages or dusted plats. Stems of leafhopper-yellowed alfalfa from nondusted plats were lower in dry matter, reducing sugar, total sugar, and total acid-hydrolyzable substances but higher in total nitrogen then stems of green plants from dusted plats. Leafhopper-yellowed second-cutting Grimm alfalfa leaves and stems from a noncaged area contained only 71 mg of carotene per kilogram of dry matter, whereas green alfalfa from a caged area, in the same small plat, contained 227 mg. The constancy of these results and their agreement with previously published data indicate that either caging or protecting certain alfalfa plants by sulfur-pyrethrum dust produces samples free from leafhopper injury for comparison with other samples exposed to spontaneous or artificial infestation.

A sand-nutrient infection technique for the study of Fusarium wilt of cotton, W. H. Tharp. (U. S. D. A. Coop. Ark. Expt. Sta.). (*Phytopathology, 28 (1938), No. 3, pp. 206–209, figs. 2*).—Six varieties of cotton were grown in sand-nutrient culture in 24 3-gal. glazed earthenware jars. Each jar, containing 10 plants, was supplied daily with 1 qt. of nutrient solution containing $CaNO_3$, NH_4NO_3, KH_2PO_4, $Mg_3(PO_4)_2$, and $MgSO_4$ (formula given). Inoculations were made with 500 cc of a 3-day growth of *F. vasinfectum* in Richard's solution (made up in tap water with iron omitted) at planting, and at 14, 21, and 28 days thereafter. Relative varietal resistance equivalent to that exhibited under very severe field conditions was obtained in 35 days, Half and Half (most susceptible), Misdel No. 3, Rowden 2088, Dixie Triumph 6, Rhyne's Cook, and Sea Island (most resistant) becoming 100, 100, 80, 55, 22.5, and 0 percent wilted, respectively.

Histology of Phymatotrichum root rot of field-grown cotton, G. M. Watkins. (Tex. Expt. Sta.). (*Phytopathology, 28 (1938), No. 3, pp. 195–202, fig. 1*).—In naturally occurring root rot of field-grown cotton, *P. omnivorum* was found to form hyphal wefts that grew over the surface of the periderm and frequently accumulated in the superficial crevices resulting from rupture and sloughing-off of the external cork layers. The periderm cell walls in contact with

hyphal agglomerations soon began to show changes in structure, color, and thickness suggesting chemical action by substances possibly liberated from the actively growing hyphae. Breaks occurred in such walls, permitting the fungus to invade the newly opened cell cavity. As this process continued the number of invaded cells increased, and the fungus thus progressed slowly through the periderm. The center of the lesion was occupied by a compact hyphal mass enveloping the remnants of partly destroyed cork walls. After penetrating the phellem the mycelia spread rapidly through the phellogen, phelloderm, phloem, and cambium, causing widespread cellular collapse and disintegration and entering the woody cylinder. The passage of hyphae from cell to cell of the xylem occurred chiefly through the pits, their lignified walls not being readily broken down by the fungus.

Culture and inoculation studies on races of the loose and covered smuts of oats, L. G. Utter (*Amer. Jour. Bot., 25 (1938), No. 3, pp. 198–210, figs. 21*).—Single sporidial, single chlamydospore, and dilution cultures were studied for 11 physiologic races of *Ustilago avenae* and 7 of *U. levis*. The colony size, color, and topography were determined for 274 culture sets of the former and 307 of the latter smut. The individual cultures comprising the different triplicate sets were generally dissimilar, and successive culture generations failed to remain constant in characters, regardless of the isolation method used. The different single chlamydospore and dilution cultures of respective races were usually distinct from one another, while the single sporidial cultures could be grouped roughly into four classes. Proper selections of individual cultures from among the different races of either species could be made to show either similarities or dissimilarities. The latter sometimes were not as pronounced as those between different isolations of the same race. Similarities or dissimilarities between races of both smuts were obtained by proper culture selection. Cultural characters offered no established means for definite or permanent identification of the races of these smuts.

Hybridization between A–1 and L–1 (race 1, respectively, of loose and covered smuts) was accomplished with two combinations of paired monosporidial cultures. The Monarch oats variety was infected with a symptomatic and morphologic loose smut type, while Gothland remained resistant. At least 16 new smut types were produced, exhibiting recombinations of factors for symptoms, morphology, and pathogenicity. Determinations of these types were made during successive inoculations of differential host varieties with populations of hybrid chlamydospores from each generation. Constant strains appeared to have been established by some of these new smut types. Through their behavior on differential oat varieties these new smut types may be considered as new physiologic races. These results thus suggest the possible origin of new specialized smut races.

The spread of onion mildew by windborne conidia of Peronospora destructor, A. G. Newhall (*Phytopathology, 28 (1938), No. 4, pp. 257–269, figs. 4*).—Of 132 conidia caught on 10 agar spore traps in a 40-min. flight over mildewed onion fields (Aug. 1, 1937) at six elevations between 50 and 1,500 ft., 75 percent germinated over night. Conidia survived several days on glass slides at 9°–24° C. in the air at relative humidities of 70, 80, and 90 percent. They also survived freezing and exposure to direct sunlight for 7 hr. in drops of cool water. Field evidence of the spread of mildew and surveys of farm and small-town gardens indicated the importance of such plantings of diseased perennial topset and multiplier onions as reservoirs from which millions of conidia may be liberated in spring. Mycelium has been found in dormant bulbs. Malachite green proved much more toxic to conidia than $CuSO_4$.

The incidence of yellow dwarf in potato varieties, C. F. Taylor. (Cornell Univ.). (*Amer. Potato Jour., 15 (1938), No. 2, pp. 37–40, figs. 2*).—From the

analyses of field-plat data presented, it is deemed apparent that the experienced variation in incidence of this virus disease was probably due either to varietal susceptibility or to klenducity (i. e., some varietal characteristic affecting the rate at which effective inoculation could occur).

Low temperature injury to late harvested potatoes, R. R. Hurst (*Canada Dept. Agr. Pub. 593 (1937), pp. 6, figs. 5*).—The soft rot of potato tubers reported was shown to follow low temperature injury to portions of the crop not dug before the first killing frost. The immediate source of chilling originated in frozen soil coming into contact with the tubers prior to and during digging. When digging was done late in the day, with the ground no longer frozen, many of the tubers escaped the effects of the frost. It is suggested that practices providing a liberal earth covering will afford valuable protection, and care against tuber injuries should be exercised. Tubers showing evidence of frost injury should not be used for seed.

Influence of certain harmful soil constituents on severity of Pythium root rot of sugarcane, R. D. Rands and E. Dopp (*Jour. Agr. Res.* [*U. S.*], *56 (1938), No. 1, pp. 53–67, figs. 5*).—Hydrogen sulfide and salicylic aldehyde were selected as examples of reduced compounds which might be formed and accentuate root rot (*P. arrhenomanes*) under temporary water-logging of poorly drained, heavy clay soils in the Louisiana sugar district. In replicated greenhouse sand-nutrient cultures 10 and 50 p. p. m. H_2S caused no significantly greater reduction in yield in the presence of *Pythium* than that produced individually by either agent in separate parallel series, thus indicating no particular influence of the H_2S on disease intensity. Concentrations of 20 and 40 p. p. m. of salicylic aldehyde, which had little if any influence on cane growth in the absence of *Pythium* and showed no effect on this fungus in culture, apparently so predisposed the roots to infection that when *Pythium* was present the reduction in plant weight was 2–7 times greater than that from the parasite alone.

Improving the drainage and general fertility level in areas such as those noted has in numerous cases markedly increased the yields of even the resistant varieties.

The influence of mineral nutrition on the reaction of sweet-corn seedlings to Phytomonas stewarti[i], E. L. Spencer and G. L. McNew (*Phytopathology, 28 (1938), No. 3, pp. 213–223, figs. 3*).—Mineral nutrition was found to exert a pronounced effect on the host-pathogen complex of bacterial wilt of corn. Golden Bantam seedlings grown in sand cultures were inoculated 10–11 days after planting with a virulent culture of *P. stewarti*[*i* (=*Bacterium stewarti*)], the severity of infection being noted 10 days later. Seedlings deficient in either N or P were only slightly infected, whereas those deficient in K were severely infected. Seedlings receiving solutions deficient in N, P, or K developed small necrotic lesions but little or no wilting of invaded leaves. At high levels of P or K, infection was manifested not only by necrotic lesions but also by a dwarfing of the seedlings and a general wilting of the invaded leaves. At high levels of N, wilting was so intense that about half the seedlings died within 2 weeks after inoculation.

Accuracy in the measurement of the activity of tobacco mosaic virus protein, H. S. Loring (*Jour. Biol. Chem., 121 (1937), No. 2, pp. 637–647*).—A comparison of the differences in numbers of lesions produced by the same percentage difference in virus protein concentration from 10^{-9} to 10^{-4} g of protein per cubic centimeter indicated the most favorable concentration for comparison of samples of crystalline virus protein to be about 10^{-6} g. In a number of tests it was shown that differences in concentration of 10 percent or greater could be readily detected by the half-leaf method on *Phaseolus vulgaris*,

using 40–50 leaves. Under like conditions, the smallest difference in concentration distinguishable in *Nicotiana glutinosa* was 20 percent.

Mosaic resistance in Nicotiana tabacum L., E. E. Clayton, H. H. Smith, and H. H. Foster (*Phytopathology, 28 (1938), No. 4, pp. 286–288, fig. 1*).—Tests of 897 seed collections from Mexico and Central and South America have yielded 36 lots resistant to mosaic, all from Colombia. It is deemed likely that these resistant qualities may be an inheritance from early Indian agriculture. Tests indicated that none are immune, but three classes of resistance have been established, viz, none to very faint markings, distinct diffuse spotting, and mild systemic mottling. From breeding tests it is concluded that two independent pairs of recessive genes are of major importance in controlling resistance. There were, however, three indications of the existence of genetic factors modifying the expression of these two basic-resistance genes. These modifiers offer a very definite problem in any breeding program, involving frequent backcrosses to the susceptible parent.

The propagation of tobacco plants from root-cuttings, J. Caldwell and A. L. James (*Phytopathology, 28 (1938), No. 3, pp. 229, 230, fig. 1*).—This note reports the spontaneous propagation of tobacco plants from root cuttings, and the transmission of mosaic virus 1 from the root pieces of artificially inoculated plants.

Contributions to the question of toxin formation by Pseudomonas tabaci [trans. title], A. C. Braun (*Zentbl. Bakt.* [etc.], *2. Abt., 97 (1937), No. 9–13, pp. 177–193, figs. 4*).—In the studies here reported, vigor of growth and toxin production for the most part, but not invariably, parallel each other, but there was no definite correlation between toxin production and gelatin digestion by different strains of *P. tabaci*. A part of the chlorophyll in attacked tobacco leaf tissues was destroyed, this decomposition proceeding so rapidly that no intermediate products could be demonstrated spectroscopically.

Studies on the fermentation of tobacco.—I, The microflora of cured and fermenting cigar-leaf tobacco, J. J. Reid, D. W. McKinstry, and D. E. Haley (*Pennsylvania Sta. Bul. 356 (1938), pp. 18, figs. 3*).—Cured, cigar-leaf type tobacco is said to have a characteristic microflora in which some selection has already taken place and which continues during fermentation, so that favored types multiply profusely before completion of the process. The fungi always present on the cured leaf are destroyed rapidly in a satisfactory fermentation, multiplication of aerobic, sporogenous bacteria and coccus forms characterizing the normal fermentation. The moisture, oxygen, and temperature relationships of the substrate determine the nature of the microbial activities, and consequently of the fermentation. Unsatisfactory leaf composition ("poor quality") or a moisture content insufficient for bacterial growth favor fungus multiplication. Oxygen consumption by the bacterial population may lead to anaerobic conditions and subsequent spoilage due to anaerobic bacterial activities. Catalase activity of the leaf is said to be closely related to the activities of the organisms present.

Control of Sclerotinia and Botrytis stem rots of greenhouse tomatoes and cucumbers, K. J. Kadow, H. W. Anderson, and S. L. Hopperstead. (Univ. Ill.). (*Phytopathology, 28 (1938), No. 3, pp. 224, 226, 227, fig. 1*).—Though usually considered of minor importance, the authors report outbreaks in a few greenhouses causing losses of 60–75 percent of the crops. Since the usually recommended control methods proved of doubtful value in saving an infected planting, several materials and methods were tested in cooperation with commercial growers. Nothing outstanding has thus far been found for controlling the *Botrytis* blossom blight and fruit rot phases on either crop. However, the

greatest losses are sustained from the stem rots, caused by the two fungi, and a bordeaux mixture made of one part $CuSO_4$, two parts lime, and enough water to make a thick paste has given nearly perfect control of the stem rots even after their establishment.

The effect of phosphate deficiencies on infection of wheat by Fusarium culmorum, F. J. GREANEY (*Canad. Jour. Res., 16 (1938), No. 1, Sect. C, pp. 27–37, fig. 1*).—Marquis wheat was grown in pot cultures of quartz sand with different types of manuring, including a fully manured control and four series under phosphate deficiency. *F. culmorum* was inoculated into half of the pots, which were then sown with inoculated seed, the remainder serving as uninoculated controls. The plants were grown for 36 days and the data treated by the analysis of variance method. Under the conditions imposed, deficiencies in phosphate failed to increase or decrease significantly the susceptibility to this root rot fungus, though the root development and total dry weight of the plants were definitely reduced.

Interrelation of take-all lesions on the crowns, culms, and roots of wheat plants, H. FELLOWS. (U. S. D. A. coop. Kans. Expt. Sta.). (*Phytopathology, 28 (1938), No. 3, pp. 191–195, figs. 2*).—Through this 5-yr. study a definite interrelation was found between the presence and severity of *Ophiobolus graminis* lesions on the roots, crowns, and culms of diseased wheat plants, an increase in their incidence or severity on one organ being accompanied by a corresponding increase on the others. All plants killed by the fungus and those on which sporulation was observed were infected in all three of these parts.

Effects of some field plot treatments on drought spot and corky core of the apple, J. C. WILCOX (*Sci. Agr., 18 (1938), No. 6, pp. 300–314, figs. 9*).—In a large number of field plat treatments continued for six years, a deficiency of irrigation water was followed by a decrease in tree vigor and by increases in drought spot and corky core. Heavy fertilizer applications (15–20 lb. per tree annually) had both detrimental and beneficial effects. More vigorous growth and more severe drought spot were induced by $(NH_4)_2SO_4$, while superphosphate had little effect on tree vigor but apparently increased drought spot. Muriate of potash had no apparent effect on tree vigor but lessened the severity of drought spot. Severe pruning increased the tree vigor only temporarily, lack of pruning markedly decreased it, and root pruning reduced it even more, while none of these treatments affected drought spot measurably. Tree crowding lessened both vigor and drought spot. Statistically significant negative correlations were found between drought spot and percentage bloom, and positive correlations between drougth spot and tree vigor. It is suggested that the last is due more specifically to the influence of nitrogen.

The use of boron for the control of internal cork of apples, J. R. MAGNESS (*Va. State Hort. Soc. Rpt., 42 (1937), pp. 139–143*).—From experimental results obtained (1936–37) it is recommended that affected orchards receive an application of borax at the rate of about ⅛ lb. per tree for trees under 15 yr. old, ½ lb. for those 15–20 yr. old, and 1 lb. for trees 21 or more years old. Two-thirds of the amounts for boric acid should be equally effective. Applications are not to be repeated until the orchard again begins to bear corky fruit. This trouble should not be confused with "cork spot" of York Imperial apples, for which no effective control method has as yet been found.

Rootstocks in relation to the black root rot (Xylaria mali) of apple trees, F. J. SCHNEIDERHAN. (W. Va. Expt. Sta. coop. U. S. D. A.). (*Amer. Pomol. Soc. Proc., 52 (1936), pp. 63–68*).—This contribution briefly summarizes some of the more important aspects of this disease and gives a progress report

on extensive experiments with rootstocks. Thus far approximately 2,000 inoculations have been made on 75 known rootstocks, 631 seedlings (apple and Manchurian crab apple), and 46 species of forest trees. None of the named rootstocks tested have proved to be immune, but it is hoped that work with additional stocks and large numbers of seedlings will eventually yield satisfactory results.

Asteroid spot, a new virosis of the peach, L. C. Cochran and C. O. Smith. (Calif. Citrus Expt. Sta.). (*Phytopathology, 28 (1938), No. 4, pp. 278–281, figs. 2*).—The symptoms of a new virus disease of peach are described. It proved to be transmissible by tissue union and to develop leaf spots in peach understock 8 weeks after grafting with affected scions. The leaf spots resemble star-shaped splotches and on the darker green leaves appear yellowish on a green background. The ultimate effects on the tree and fruit are unknown.

The relation of concentration of fungicides and bud development to control of peach leaf curl, A. B. Groves. (Va. Expt. Sta.). (*Phytopathology, 28 (1938), No. 3, pp. 170–179, fig. 1*).—In tests on peach trees sprayed in the fall and spring with fungicides of varying strengths, control of *Exoascus deformans* infection was obtained with the weakest concentrations tried, viz, with lime-sulfur 1–50, bordeaux mixture 2–4–100, wettable and dry lime sulfurs 16–100, soluble sulfur 8–100, and Kolofog 16–100. On trees sprayed at intervals from dormancy to bloom with lime-sulfur 1–40, control was obtained at all stages. Control had previously been obtained with sprays applied to trees with buds conspicuously swollen or even with the leaf tips exposed and during seasons favorable to development of leaf curl.

Home-made wettable sulphur as a peach fungicide, R. H. Hurt. (Va. Expt. Sta.). (*Amer. Pomol. Soc. Proc., 52 (1936), pp. 184–187*).

Dwarf disease of the loganberry, S. M. Zeller. (Oreg. State Col.). (*Better Fruit, 32 (1938), No. 8, p. 18*).

Lightning injury in banana plantations, O. A. Reinking. (N. Y. State Expt. Sta.). (*Phytopathology, 28 (1938), No. 3, pp. 224, 225, fig. 1*).—Spots of killed banana plants 40–60 ft. in diameter have been noted in large banana plantations. These areas appear after severe electric storms, and it is believed that they could be caused only by lightning. The three spots examined were characterized by a collapsed, twisted, cooked mass of plants in the center of the areas, and by partially scalded and yellowed plants on the outer edges. The worst affected plants were killed to the ground, but the rhizomes were not severely affected. Later examination of the spots indicated that suckers had grown from the rhizomes, thereby again filling the affected areas with healthy plants.

Reclaiming decadent citrus trees, W. H. Friend. (Tex. Expt. Sta.). (*Tex. Farming and Citric., 14 (1938), No. 8, pp. 6, 16*).—The results of this 5-yr. field-plat study point to salinity and alkalinity as the principal factors in citrus decline. The effects of corrective measures indicated that malnutrition is the cause, and that good orchard practices can bring trees not otherwise handicapped back into profitable production. The use of acid-forming materials, along with liberal amounts of organic matter and possibly some minor elements, seems to be indicated. The importance of adequate subsoil drainage was also clearly demonstrated.

Crosscuts in the fruitstalks of date palms, D. E. Bliss. (Calif. Citrus Expt. Sta.). (*Date Growers' Inst. Rpt., 14 (1937), pp. 8–11, figs. 2*).—The evidence presented suggests that the abnormal crosscuts in the fruitstalks are in some way associated with structural weaknesses, and that the micro-organisms (e. g., *Fusarium* spp.) do not enter the picture until the fractures have reached

the surface. Final decision must await further study, but the theory is advanced that these cavities result from weakness and unequal strains in the zone of most rapid growth. Losses may be anticipated by retaining more fruit bunches than are expected to mature, thus providing for an adequate harvest despite the injury from crosscut disease.

A rust of the pimento tree in Jamaica, B. W. I., J. D. MacLachlan (*Phytopathology, 28 (1938), No. 3, pp. 157–170, figs. 3*).—A sudden outbreak of *Puccinia psidii* infection on the pimento tree *Pimenta officinalis* occurred in the spring of 1934. Within two years its incidence reached serious proportions at the higher altitudes. There appear to be two distinct physiological strains of this rust parasitizing species of *Pimenta* and *Eugenia*, respectively, in Jamaica. The expanding foliage, inflorescences, and succulent young twigs of the pimento tree are subject to infection. The fungus is perpetuated in Jamaica in the urediospore stage. Teliospores were found, but no host for the haploid stage was recognized. Use of fungicides to control the rust seems impracticable, but prevailing temperatures at various altitudes have a marked effect on its incidence. A relatively large proportion of the pimento is reaped below an altitude of 1,000 ft., where the rust is either absent or does no material harm because the prevailing high temperature inhibits infection.

Soil temperature important factor in chlorosis of gardenias, L. H. Jones. (Mass. State Col.). (*Florists' Rev., 81 (1938), No. 2098, pp. 19, 20, figs. 2*).—In tests with the Veitchii variety healthy plants were made chlorotic and chlorotic plants were brought back to normal by the one factor of soil temperature. In tests involving soil temperatures of 50°–90° F., hard plants became chlorotic at 64° (or less) in 40 days and a slight trace was noted at 68°, but none appeared at 72° or above. The rate of growth and size of leaf were also definitely related to soil temperatures. To what extent fluctuating or constant soil temperatures can influence bud set and drop are problems needing further investigation.

A bacterial bud and stem rot of rocket larkspur, P. A. Ark, C. M. Tompkins, and R. E. Smith. (Univ. Calif.). (*Phytopathology, 28 (1938), No. 4, pp. 281–283*).—A bacterial disease of rocket larkspur, *Delphinium ajacis*, prevalent in California, is described. Except for minor differences, the causal organism agrees rather closely with *Erwinia phytophthora* [=*Bacillus phytophthorus*]. All *Delphinium* species and varieties tested proved susceptible, and potato tubers and carrot roots rotted promptly on inoculation. Seed treatment for 10 min. in hot water at 50°–55° C. gave healthy plants, as against 18 percent infection in those from untreated seed.

The lily project: *Mosaic, Botrytis blight, and bulb rots cited as outstanding barriers to successful lily culture*, C. E. F. Guterman. ([N. Y.] Cornell Expt. Sta.). (*Hort. Soc. N. Y., Mo. Bul., 1938, Feb., pp. 3–7, fig. 1*).—This contribution reports progress in this lily disease project, begun in 1927 in cooperation with the Horticultural Society of New York, The Boyce Thompson Institute, and the New York Botanical Garden.

Nematodes infesting red spiderlilies, G. Steiner (*Jour. Agr. Res. [U. S.], 56 (1938), No. 1, pp. 1–8, figs. 4*).—Red spiderlilies (*Lycoris radiata*) in the South Atlantic region of the United States are said to be attacked by the bulb or stem nematode *Ditylenchus dipsaci*, the bud or leaf nematode *Aphelenchoides fragariae*, and by a new entoparasite of the vagrant type attacking the root exodermis exclusively, viz, *Rotylenchus brachyurus* n. sp. In one case infestation by the first species is considered to have originated from narcissus by an apparently natural transfer. The symptoms induced by *D. dipsaci* and *A. fragariae* in red spiderlily bulbs are brownish rings resembling those produced

by them in narcissus bulbs. *Cephalobus persegnis* was also found as the apparent cause of brown rings in red spiderlily bulbs. *Dorylaimus subtilis* also occurred as a root parasite, but appeared to be of little significance as a pathogen.

Experiments with aphids as vectors of tulip breaking, P. BRIERLEY and M. B. MCKAY. (Oreg. Expt. Sta. coop. U. S. D. A.). (*Phytopathology, 28 (1938), No. 2, pp. 123–129*).—The data (1926–30) reported confirm earlier reports by the authors and by M. Hughes that *Myzus persicae* and *Macrosiphum (Illinoia) solanifolii* are vectors of tulip breaking (mosaic). Both species are vectors of both viruses distinguished by F. P. McWhorter. *Myzus circumflexus* apparently transmitted breaking in one trial. *M. solani, Anuraphis tulipae*, and *Rhopalosiphoninus tulipella* failed to transmit breaking in parallel trials. No symptoms appeared during the season of inoculation in any experiment.

Inoculations with forest tree rusts, H. H. YORK (*Phytopathology, 28 (1938), No. 3, pp. 210–212, fig. 1*).—*Pinus resinosa, P. sylvestris, P. radiata,* and *P. ponderosa* were inoculated with aeciospores of the *Peridermium* strain known as the "Woodgate rust," the inoculations being kept moist by a celluloid "iceless refrigerator" described. Since it was deemed possible that this rust might prove to be one of the western gall rusts having species of the Scrophulariaceae as alternate hosts, *Chelone glabra* and *Scrophularia leporella* were also inoculated in the same way. In these tests the percentage of germination in the inoculation chambers was far greater than that in water cultures, and the iceless refrigerator described proved to be the most convenient, dependable, and labor-saving device thus far used by the author for field inoculations of forest trees. On the pines, infection spots appeared on the stems within 4–6 weeks, but none whatever developed on the two Scrophulariaceous species.

W. P. A. crews find copper sulphate effective against Dutch elm disease (*Jour. Forestry, 36 (1938), No. 3, p. 342*).—This note records successful field experience in killing affected trees with the fungus parasite by packing $CuSO_4$ under the loosened bark.

Susceptibility of Ribes to Cronartium ribicola in the West, J. W. KIMMEY (*Jour. Forestry, 36 (1938), No. 3, pp. 312–320*).—A total of 22,046 tests of the susceptibility and telium-producing capacity have been made (15 yr.) on 51 species and forms of *Ribes* in British Columbia and Oregon. Where possible, the tests were on naturally grown *Ribes* exposed to infection from adjacent naturally grown pines producing abundance of aeciospores, and where this was impossible such conditions were simulated. The test plants of each species were classified as being open, part-shade, or shade forms, and the data for each group were kept separate throughout. The various species and forms are listed both as to the order of their susceptibility and as to their ability to produce telia.

Generally the more susceptible plants produced the more telia, and vice versa. Within a species, the part-shade form (less often the shade form) was in most cases the most susceptible and usually produced the most telia, while the open form was the most resistant and usually produced the fewest. Of the species tested, *R. nigrum* was the most susceptible and produced the most telia, while the open form of *R. cereum* was the most resistant and produced the fewest telia. The percentage of infection-producing telia tended to be greater on the more susceptible species and forms, and vice versa.

Initial tests of the distance of spread to and intensity of infection on **Pinus monticola by Cronartium ribicola from Ribes lacustre and R. viscosissimum**, T. S. BUCHANAN and J. W. KIMMEY (*Jour. Agr. Res.* [*U. S.*], *56 (1938), No. 1, pp. 9–30, figs. 10*).—In field experiments (1928, 1930) conducted in the interior white pine region of British Columbia, *C. ribicola* was permitted

to spread from centrally located *Ribes* to surrounding natural stands of *P. monticola* reproduction. In six tests of *R. lacustre* an average of 155.8 ft. of live stem supported infection which, within 1 yr., spread to 7.5 percent of the pines inside a circular acre and damaged 2.9 percent of them. In one test only 14.4 ft. of live stem was responsible for damage to 2.8 percent of the pines. In six tests of *R. viscosissimum* an average of 88.5 ft. of live stem supported infection which, within 1 yr., spread to 4.5 percent of the pines inside a circular acre and damaged 2.3 percent of them. In one test only 31.0 ft. of live stem was responsible for damage to 5.6 percent of the pines. It was further determined that, under the climatic and ecological conditions obtaining, *C. ribicola* can spread for at least 150 ft. from *R. lacustre* to *P. monticola* and for at least 250 ft. from *R. viscosissimum*. In all tests the intensity of pine infection reached an almost negligible low at 50–60 ft. from the central *Ribes*.

Relation of stomata to infection of Pinus strobus by Cronartium ribicola, R. R. Hirt (*Phytopathology, 28 (1938), No. 3, pp. 180–190, figs. 2*).—Stomatal movements in white pine needles were determined from epidermal strips fixed in absolute alcohol, and needle penetration by sporidial germ tubes was studied externally with an Ultropak and internally from sections of inoculated needles. The stomata were found to open and close periodically, their activity apparently bearing no relation to needle infection. Sporidial germ tubes were seen to penetrate directly through the walls of the epidermal cells, but none were found entering the needles through the stomata. If stomatal infection should occur, the germ tubes from primary sporidia would require about 10 hr. of favorable weather to reach the mesophyll.

The stomata are arranged in rows on the ventral surface of the needles. The distance between the pores in contiguous rows averaged 88–95μ between pores within a row 32μ, and the distance from any point on the margin of a stoma-bearing surface of a mature needle to the nearest pore averaged 161–165μ. The opening and closing of individual stomata occurs in part through the movement of the beak-like projections of the guard cells.

Blister rust damage to merchantable western white pine, T. S. Buchanan (*Jour. Forestry, 36 (1938), No. 3, pp. 321–328, fig. 1*).—Damage to and death of young western white pine *Pinus monticola* by blister rust attack has been known for some time in British Columbia, and studies have indicated further damage to come. Within recent years similar injury has become apparent in various Idaho areas. Information as to what may happen to merchantable-size trees of this species not having been previously available, this paper presents the results of studies in these two regions as showing that infection may occur in the crowns of even the tallest trees, and that it is entirely possible under conditions favorable to infection for 50 percent or more of the merchantable timber in a stand to suffer eventual damage from a relatively short exposure to blister rust infection on *Ribes*. In general, the larger the tree the longer was the time between infection and actual damage. The results of these local studies are taken to indicate merely what can happen under more or less ideal conditions for infection and development.

A root and collar disease of pine seedlings caused by Sphaeropsis ellisii, B. S. Crandall (*Phytopathology, 28 (1938), No. 3, pp. 227–229*).—During an investigation of the *Phytophthora cinnamomi* root disease of *Pinus resinosa*, seedlings with symptoms differing from the typical *Phytophthora* rot were noted. This rot was not characterized by infiltration of resin in the wood, and the invaded bark was deep red with black streaks continuing into the xylem and often throughout the stele. *Pinus strobus* seedlings with similar symptoms were also found. *S. ellisii* was isolated from trees of both species having these

symptoms, and inoculations proved it to be comparable in virulence as a root rot organism to *Phytophthora*.

A progress report on laboratory tests of the relative durability of different varieties of black locust subjected to certain wood decay fungi, R. R. HIRT (*Jour. Forestry, 36 (1938), No. 1, pp. 53–55*).—"Evidence is submitted that the heartwood of shipmast locust, a variety of *Robinia pseudoacacia*, is more resistant to decay by certain fungi in laboratory tests than the heartwood of the common black locust."

The quality and toxicity of coal-tar creosote extracted from red oak ties after long periods of service, with special reference to the decay resistance of treated wood, H. SCHMITZ, H. VON SCHRENK, and A. L. KAMMERER (*Amer. Wood-Preservers' Assoc. Proc., 33 (1937), pp. 35–90, figs. 16*).—From a comprehensive study of the quality and toxicity of the extracted creosotes and from a study of the decay resistance, under conditions most favorable to wood-destroying fungi, of the wood of two red oak ties after comparatively long service, the following conclusions are drawn:

The changes in the character of the creosotes during service are most pronounced in the outer layers of treated wood. At completion of treatment all wood penetrated contained creosote of the same distilling ranges, specific gravity, etc. After a comparatively long service period the character of that remaining indicated profound changes, depending on its location in the tie. Toxicity tests (Petri-dish method) of the creosotes extracted from 18 regions of each tie showed great differences in toxicity after comparatively long service periods, and their toxicities corresponded with certain other physical characteristics. Despite these wide limits in toxicities of the extracted creosotes, there was little of practical significance, since the ties were sound and resistant to decay in all parts even when exposed to active wood-destroying fungi under optimum conditions for 10 mo. The continued protection of the outer wood layers, even with low toxicity, appears due at least in part to the outward movement of the toxic constituents of the creosote from the inner wood layers. Thus the greater the amount of creosote originally injected, the longer will this "feeding process" take place. Determination of the initial toxicity of creosote and other coal-tar products cannot be taken as a guide to their ultimate preservative value. No claim is made that the toxicity of creosote is not important for its wood-preserving action. Rather, the questions are raised as to not only how high the initial toxicity must be to render effective service, but also as to how high it must remain to serve as an effective wood preservative.

Some toxicity data and their practical significance, E. BATEMAN and R. H. BAECHLER (*Amer. Wood-Preservers' Assoc. Proc. 33 (1937), pp. 91–104*).—The toxicity and cost data here included cover the compounds (30 or more) seeming to offer any promise as wood preservatives after consideration of their toxicity, cost, volatility, solubility in a cheap vehicle, corrosiveness to metals, effect on wood, and health hazards. Several of the compounds studied, said to be of proved value, have served as standards, some have been tried and found wanting, and several others are being tested in service.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Mammals of Iowa, T. G. SCOTT (*Iowa State Col. Jour. Sci., 12 (1937), No. 1, pp. 43–97, fig. 1*).—A brief introduction and review of the literature, with a three-page list of references appended, is followed by a classified list of mam-

mals of known recent occurrence. The forms found in Iowa, their synonymy, occurrence, etc., are then considered.

Report on the occurrence of insect and other pests in Finland in 1926 and 1927 [trans. title], Y. Hukkinen, J. Listo, and N. A. Vappula ([*Finland*] *Valtion Maatalouskoet. Julkaisu.* (*Staatl. Landw. Versuchstät. Veröffentl.*), *No. 82 (1936), pp. 107, figs. 6; Ger. abs., pp. 99–106*).—The occurrence of the more important insect and other animal pests in Finland is reported upon, the arrangement being in systematic order.

Studies on the feeding habits of Bandicota nemorivaga Hodgson.—I, The likes and dislikes and the quantity of the food, S. Takano and T. Kondo (*Govt. Sugar Expt. Sta., Formosa* [*Taiwan*], *Rpt., 4 (1937), pp. 213–252, pl. 1, figs. 17; Eng. abs., pp. 251, 252*).—In this report on the feeding habits of the giant field rat *B. nemorivaga*, the authors discuss its likes and dislikes and the quantity of food taken as related to its control by the use of poison baits.

Game scarcity: Some causes and cures, G. Bump (*Amer. Wildlife, 26 (1937), No. 4, pp. 51, 52, 58–60, figs. 4*).—An analysis of some of the causes of and cures for game scarcity is presented in this contribution.

Grasshopper poison and wildlife, W. E. Beed. (Iowa Expt. Sta.). (*Amer. Wildlife, 26 (1937), No. 4, pp. 53, 61, 64, figs. 3*).—Work conducted from June 16 to August 22, 1936, indicated that poison baits when properly used are not injurious to wildlife.

Catalogue of birds of the Americas, IX, X, C. E. Hellmayr (*Field Mus. Nat. Hist.* [*Chicago*] *Pub., Zool. Ser., 13 (1936), pt. 9, pp. V+458; 13 (1937), pt. 10, pp. V+228*).—The ninth part of this work (E. S. R., 74, p. 226) catalogs the Passeriformes families Tersinidae and Thraupidae, and the tenth part the Icteridae.

On the food of some British birds, J. W. Campbell (*Brit. Birds, 30 (1936), No. 7, pp. 209–218*).—These notes report upon the results of examinations made during the last 2 yr. of stomachs of 15 species of birds, including several gallinaceous forms.

The food of Australian birds: An analysis of the stomach contents, A. M. [A. H.?] Lea and J. T. Gray (*Emu, 34 (1935), No. 4, pp. 275–292; 35 (1935), Nos. 1, pp. 65–98; 2, pp. 145–178; 35 (1936), Nos. 3, pp. 251–280; 4, pp. 335–346*).—The stomach contents of 1,708 individuals covering 301 species of birds, collected by a number of ornithologists and sent to the South Australian Museum, are reported upon. The nonvegetable food, with the number of species of consuming birds, is shown in the first appendix, and in the second appendix the data are analyzed for the families of birds where 10 or more individuals are involved.

Nest parasitism of hawks, W. D. Sargent (*Auk, 55 (1938), No. 1, pp. 82–84*).—A very high percentage of parasitism by maggots of *Protocalliphora splendida sialis* Shan. & Dobr. was found near Ithaca, N. Y., during the years 1935 and 1936 in the nests of soaring hawks of the family Accipitriidae. Parasites were taken in great numbers during this period from both old and new nests of red-tailed, red-shouldered, and Cooper's hawks, but none were found in nests of marsh, sharp-shinned, and duck hawks.

The natural history of magpies, J. M. Linsdale. (Univ. Calif.). (*Cooper Ornithol. Club, Pacific Coast Avifauna No. 25 (1937), pp. 234, pls.* [*9*], *figs. 20*).—This contribution from the Museum of Vertebrate Zoology brings together scattered information published in several languages and first-hand observations in the field in central California extending over a period of several years upon the well-marked yellow-billed form, *Pica nuttallii*, a study made of it over

practically its entire range, and field studies of the black-billed race, *P. pica hudsonia*, in various localities in its range in the western United States. A 24-page list of the literature cited is included. Reference is made to the contribution of Kalmback (E. S. R., 58, p. 343) on their relation to agriculture.

Winter nesting and winter food of the barn owl in South Carolina, S. Cottam and A. L. Nelson (*Wilson Bul.*, *49* (*1937*), *No. 4*, *pp. 283–285*).—A report of laboratory pellet analyses of the food remains found in 21 nest pellets of the barn owl (*Tyto alba pratincola*) collected on the bird refuge near McClellanville, S. C., on November 30, 1936, is included in this contribution. From the indigestible residue of 21 meals it was found that 17 rice rats, 7 meadow mice, 1 undetermined rodent, 3 birds (presumably clapper rails), 1 Virginia rail, and 5 seaside sparrows had been consumed.

Emergency values of some winter pheasant foods, P. L. Errington. (Iowa Expt. Sta.). (*Wis. Acad. Sci., Arts, and Letters, Trans.*, *30* (*1937*), *pp. 57–68*).—From these studies the author has been able to draw a number of tentative conclusions on pheasant foods of the group intermediate between those plainly dependable as winter staples and those clearly not so.

"Fruits of fleshy consistency or those made up largely of digestion-resistant seeds are quite inadequate as winter emergency foods for pheasants. These include sumac, poison-ivy, coralberry, and very likely other foods untested in the pheasant experiments, such as rose hips, dried wild grapes, bittersweet, elderberry, Virginia creeper, etc. Some substantial appearing seeds as those of sweetclover and velvetleaf, while freely eaten and finely ground up during digestive processes, do not qualify as staples. . . . Some foods doubtless have more sustentative value when eaten with something else. Smartweed achenes which have a way of slipping unbroken through the digestive tract may be an example. . . . . Buds and catkins among herbaceous foods may be of definite utility in enabling populations to survive sleet storms and temporary emergencies of this sort, as on this type of diet the daily loss rates are manifestly less than when the birds have only innutritious foods to eat, or perhaps almost no organic material at all except for dried grasses and leaves."

How many species of avian malaria parasites are there? R. D. Manwell (*Amer. Jour. Trop. Med.*, *15* (*1935*), *No. 3*, *pp. 265–283*, *figs. 49*).—It is concluded that of the numerous species of avian malaria parasites described, only seven have been studied sufficiently to make their existence as separate species and their main characteristics reasonably certain. It is considered very probable that a number of other species of avian malaria parasites exist. Three of those already described are probably good species, and there is evidence that there are undescribed forms. It is pointed out that morphological characters alone are not always sufficient to distinguish species.

A table with the distinguishing characteristics of 10 species of avian plasmodia is included.

The occurrence of the avian malarias in nature, R. D. Manwell and C. Herman (*Amer. Jour. Trop. Med.*, *15* (*1935*), *No. 6*, *pp. 661–673*).—An investigation aimed at determination of the frequency of malaria infection among the commoner species of birds in eastern North America is reported upon.

A survey which covered a total of 652 birds belonging to 34 different species resulted in the finding of 54 cases of malaria, a number of which were mixed infections. The species of plasmodia represented included the following, in the order of their frequency: *Plasmodium praecox* 23, *P. cathemerium* 12, *P. circumflexum* 7, *P. vaughani* 6, *P. elongatum* 5, *P. polare* 4, *Plasmodium* sp. ? 3, and *P. nucleophilum* 1. This and other work is said to indicate that at least the first 5 of these species are probably cosmopolitan in distribution, assuming

that *P. tenue* and *P. tumbayensis* are the same as *P. vaughani*, as seems probable.

Bird malaria and mosquito control, C. M. Herman (*Bird-Banding, 9 (1938), No. 1, pp. 25–31*).—In this contribution, presented with a list of nine references to the literature, it is shown that a large percentage of birds in nature are infected with a mosquito-borne malaria and that this fact presents a phase of a problem of wildlife management that has been overlooked almost entirely.

In considering its occurrence in and effect on the birds, it is shown that more than 30 North American bird species are known to harbor at least 1 of the 8 avian species of *Plasmodium* prevalent. In the notes on transmission and the mosquitoes known to transmit one or more species of *Plasmodium*, it is pointed out that while the malaria parasites of man are transmitted by anopheline mosquitoes members of the culicine group are vectors of avian malaria.

Control measures are considered.

[Contributions on economic insects in Iowa] (*Iowa State Hort. Soc. Rpt., 71 (1936), pp. 63–70, 72–76, 363–382, figs. 18*).—These contributions on economic insects in Iowa (E. S. R., 77, p. 360) are as follows: Codling Moth Investigations, by T. R. Hansberry and C. H. Richardson (pp. 63–66), and Apple Leafhoppers in Iowa: Their Life Histories and Control, by C. H. Richardson and T. R. Hansberry (pp. 67–70) (both Iowa Expt. Sta.); My Experience in the Control of the Apple Leaf Hopper, by E. A. Carter (p. 70); Controlling Grasshoppers in Gardens and Orchards in Iowa, by C. J. Drake and G. C. Decker (pp. 72–76), and Results of the 1936 Honeybee Disease Resistance Program, by O. W. Park, F. C. Pellett, and F. B. Paddock (pp. 363–376) (E. S. R., 77, p. 373) (both Iowa); and Influence of Pollen Reserves on the Surviving Populations of Overwintered Colonies, by C. L. Farrar (pp. 376–382).

Report on the entomological section for the year ending 31st March 1937, R. W. E. Tucker (*Agr. Jour. [Barbados], 6 (1937), No. 2, pp. 74–82*).—The work of the year in Barbados (E. S. R., 76, p. 824) reported upon relates to the sugarcane borer, including data on losses caused from 1929 to 1937, inclusive; the root borer of sugarcane *Diaprepes abbreviatus*; the brown hardback *Lachnosterna smithi*; the West Indian sweetpotato weevil; the pink bollworm; the cotton leaf worm, etc.

[Observations of the insect enemies of cultivated plants in the New Hebrides], J. Risbec (*Faune Colon. Franç., 6 (1937), No. 1, pp. 10–87, 89–207, pls. 2, figs. 283*).—Insects of economic importance as enemies of the coconut, coffee, cacao, banana, orange, and several other plants, together with notes on several predators and parasites, are reported upon. Two enfolded colored plates illustrate many of the insects considered.

[Contributions on economic insects and insecticides] (*East Malling [Kent] Res. Sta. Ann. Rpts., 23 (1935), pp. 164–197, figs. 3; 24 (1936), pp. 222–239, 246–258, 267–275, 302, figs. 5*).—Contributions relating to economic insects in the 1935 annual report of the East Malling Research Station (E. S. R., 73, p. 643; 75, p. 807) include the following: Notes on Some Interesting Mites and Insects Observed on Hops and Fruit Trees in 1935 (pp. 164–170) and Studies on the Transmission of the Strawberry Virus "Yellow-Edge" Disease by Insects—II, Aphid Transmission Experiments and Period of Infectibility (pp. 171–176) (E. S. R., 73, p. 348), both by A. M. Massee; Studies of Impregnation of Tree Banding Materials—II, Apple Blossom Weevil and Codlin Moth Experiments in 1935 (a Progress Report), by R. M. Greenslade and A. M. Massee (pp. 177–183); A Note on the Treatment of Dormant Nursery Stock Against Woolly [Apple] Aphis, by R. M. Greenslade (pp. 184, 185); Observations on Codlin Moth (*Cydia pomonella* L.) in 1935, by W. Steer (pp. 186–190); and A Field Spraying

Trial of Combined Fungicide-Contact-Insecticide Sprays in 1935—A Progress Report, by M. H. Moore and H. B. S. Montgomery (pp. 191–197).

Contributions included in the 1936 report are as follows: Notes on Some Interesting Mites and Insects Observed on Fruit Trees in 1936 (pp. 222–228) and Studies on the Transmission of the Strawberry Virus "Yellow-Edge" Disease by Insects—III, Aphid Transmission Experiments and Period of Infectibility (pp. 229–231), both by A. M. Massee; Studies of Impregnation of Tree Banding Materials—III, Apple Blossom Weevil [*Anthonomus pomorum* L.] and Codling Moth Experiments in 1936 (a Progress Report), by A. M. Massee, R. M. Greenslade, and J. H. Brair (pp. 232–239); Investigations on the Preparation of Field-Made Winter Petroleum-Oil Sprays—A Progress Report, by H. Shaw and W. Steer (pp. 246–249); Observations on Codling Moth (*Cydia pomonella* L.) in 1936, by W. Steer (pp. 250–258); A Field Spraying Trial of Combined Fungicide-Insecticide Sprays in 1936—A Progress Report, by M. H. Moore and H. B. S. Montgomery (pp. 267–275), including an appendix by W. Steer (pp. 273, 274); and The Control of Codling Moth: A Suggested Spray Programme, by W. Steer (p. 302).

Report of the entomologist, T. W. Kirkpatrick (*East African Agr. Res. Sta., Amani, Ann. Rpt., 8 (1936), pp. 14–16*).—A brief account of work at Amani.

Insect pest work (*Empire Cotton Growing Corp., Expt. Stas. Prog. Rpts., 1935–36, pp. 29–42*).—Work at the Barberton Experiment Station, Union of South Africa, is reported upon. Part 1 of this report relates to Investigations on the American and Red Bollworms, by F. S. Parsons and J. Marshall (pp. 29–36), and part 2 to Investigations on Cotton Stainers [*Dysdercus fasciatus* and *D. nigrofasciatus*] and Internal Boll Disease, by E. O. Pearson (pp. 37–42).

Insect pests, P. R. Viljoen (*Farming in So. Africa, 11 (1936), No. 129, pp. 509–512, figs. 2*).—This report of the work of the year (E. S. R., 76, p. 216) relates particularly to the occurrence of and control work with the so-called brown (*Locustana pardalina* Walk.) and red (*Nomadacris septemfasciata* Serv.) grasshoppers.

Entomology division.—Annual report, 1935, H. W. Simmonds (*Fiji Dept. Agr. Ann. Bul., 1935, pp. 19–22*).—The occurrence of and work with the more important insects of the year are reported upon (E. S. R., 74, p. 814).

The fauna of injurious soil insects of arable land, M. S. Ghilarov (*Bul. Ent. Res., 28 (1937), No. 4, pp. 633–637*).—This contribution from the State Research Institute of Rubber and Guttapercha, Moskva (Moscow), is presented with a list of 15 references to the literature.

The insects associated with bracken, A. A. Meikle (*Agr. Prog. [Agr. Ed. Assoc., Gt. Brit.], 14 (1937), No. 1, pp. 58–60*).—Observations of bracken insects in the west of Scotland are noted.

Insects and other pests injurious to the production of seed in herbage and forage crops, H. F. Barnes (*Imp. Bur. Plant Genet., Herb. Plants (Aberystwyth), Bul. 20 (1937), pp. 31+III*).—This is a practical contribution from the Rothamsted Experimental Station.

Potato spraying in eastern Virginia in 1937, L. D. Anderson and H. G. Walker (Va. Truck Expt. Sta.). (*Amer. Potato Jour., 15 (1938), No. 3, pp. 64–66*).—In these spraying experiments a calcium arsenate-bordeaux mixture (2–4–6–50) gave significant increases in yield when potato flea beetles or potato leafhoppers were present in injurious numbers and did not give significant differences in yield when these pests were not present to an injurious extent.

[Contributions on fruit insects] (*Ind. Hort. Soc. Trans., 1936, pp. 69–85*).—Contributions presented at the January 1937 annual meeting of the Indiana

Horticultural Society (E. S. R., 76, p. 825) include the following: Orchard Insect Problems, by J. J. Davis (pp. 69–72), and Results of the 1936 Spray Plots, by G. E. Marshall (pp. 72–76), (both Ind. Expt. Sta.); and Codling Moth Investigations During 1936 at the Vincennes Laboratory, by L. F. Steiner, R. F. Sazama, A. J. Ackerman, and S. A. Summerland (pp. 76–85).

Pests of ornamental garden-plants, G. Fox Wilson (*[Gt. Brit.] Min. Agr. and Fisheries Bul. 97 (1937), pp. V+128, pls. 36, figs. 29*).—This account, prepared for use in Great Britain, deals at some length with control measures (pp. 4–21), followed by accounts of general pests and pests of lawns, the rose border, herbaceous border, annual border, rock garden, waterside and woodland garden, bulbs and corms, ornamental trees and shrubs, and the greenhouse. A subject index is included.

The hollyhock seed moth Platyedra malvella Hübn., together with notes on the distribution of Apion radiolus Kirby and an associated Clinodiplosis species, H. F. Barnes (*Ann. Appl. Biol., 24 (1937), No. 3, pp. 589–599, pl. 1, fig. 1*).—A contribution from the Rothamsted Experimental Station on *P. malvella*, the larva of which as a pest of the hollyhock is restricted to the southeastern counties of England. There is only one generation a year, the moths being on the wing from late in June to early August. An ichneumonid parasite, *Angitia rufipes* Grav., has been reared in small numbers from Essex and Hertfordshire material.

Apion radiolus and a gall midge (*Clinodiplosis* sp.), which are also found in the seed heads of hollyhock, are generally distributed throughout England. The *Clinodiplosis* sp. also occurs in Wales and Ireland.

Insect enemies of western forests, compiled by F. P. Keen (*U. S. Dept. Agr., Misc. Pub. 273 (1938), pp. 210, figs. 92*).—Following an introduction and a discussion of the kinds of forest insects and the losses they cause, the relation of insects to forest management, and the determination of the causes of forest-tree damage, insects affecting seed production (pp. 15–23) and injurious to seedlings in nursery or forest (pp. 23–28), to young trees (saplings and poles) (pp. 28–57), to mature forest trees (pp. 57–140), to wood and forest products (pp. 141–163), and to forest range plants (pp. 164–166) are considered. A discussion of natural control factors and control of injurious forest insects is included, as is a list of 95 references to the literature and an index of host trees and a general index.

Studies of Nearctic aquatic insects, I, II (*Ill. Nat. Hist. Survey Bul., 21 (1937), Art. 3 pp. [3]+57–99, pl. 1, figs. 86*).—In part 1 of this contribution (pp. 57–78) H. H. Ross reports upon the Nearctic alder flies of the genus *Sialis* (Megaloptera, Sialidae). In part 2 (pp. 78–98) T. H. Frison presents descriptions of Plecoptera, with special reference to the Illinois species (E. S. R., 73, p. 209).

Studies on the possibilities of devil's shoestring (Tephrosia virginiana) and other native species of Tephrosia as commercial sources of insecticides, A. F. Sievers, G. A. Russell, M. S. Lowman, E. D. Fowler, C. O. Erlanson, and V. A. Little (*U. S. Dept. Agr., Tech. Bul. 595 (1938), pp. 40, pls. 5, figs. 5*).—These studies of devil's shoestring (*T. virginiana*), conducted by the Bureau of Plant Industry in cooperation with the Texas Experiment Station, were commenced with a survey in 1934 in 17 States. The present work was undertaken (1) to determine the general distribution of the plant and other native domestic species, their relative toxicity, and the relation of toxicity to geographic source, (2) to determine what factors are responsible for the wide differences in the contents of rotenone and other toxic substances, (3) to in-

crease the amount of toxic material in the roots by selection and breeding or other means, and (4) to study the cultural requirements of the plant and determine the cost of its cultivation and its crop possibilities in general.

The results of field surveys and of some of the miscellaneous studies completed in connection with cultural studies under way are reported, the details being given in 11 tables. They indicate that "(1) plants from all but a few restricted districts are lacking in insecticidal value; (2) toxic plants are found almost exclusively in the region extending south and west of central Georgia, in northeast Florida, and in northeast Texas; and (3) the Durham color test, which is easily made, gives a reasonably reliable indication of the plant's toxicity to flies and is, therefore, an excellent means of determining the value of plants rapidly in the field.

"More elaborate field studies in 1935 confirmed the conclusion that the species is toxic only in a few relatively small districts in Texas, Florida, and Georgia, the location and size of which are described.

"Twelve of the 17 species of *Tephrosia* occurring in the South and East were studied with regard to their taxonomy and toxicity. Judged by their insecticidal properties and their favorable growth habits, *T. virginiana* and *T. latidens* are the only species of immediate interest, but several others should be further investigated. *T. latidens* is abundant in the Choctawhatchee National Forest in the western part of Florida, where its toxicity is quite uniform. This fact and its growth habits, which are advantageous in propagation, suggest that it may have commercial possibilities. . . .

"No relation could be observed between any botanical characters and the toxicity of individual plants of *T. virginiana*. The eastern and western types of this species, though quite distinct, are both subject to wide variation in toxicity."

Cultivation of derris in the Far East (*Internatl. Rev. Agr.* [*Roma*], *28* (*1937*), *No. 1, pp. 1T–12T*).—The present status of the cultivation of derris in the Federated Malay States, Straits Settlements, Borneo, Philippine Islands, and Dutch East Indies and chemical studies of the roots are reported upon.

Oil sprays for deciduous fruit trees by the tank-mixture method, A. D. Borden (*California Sta. Circ. 345* (*1938*), *pp. 15, figs. 4*).—This circular, presenting in condensed form the information originally published in Bulletin 579 (E. S. R., 72, p. 360), supersedes that publication and in addition includes considerable new data.

The Virginia spray program, R. H. Hurt. (Va. Expt. Sta.). (*Va. State Hort. Soc. Rpt., 42* (*1937*), *pp. 91–95*).

An international termite exposure test.—Eighth progress report, G. M. Hunt and T. E. Snyder (*Amer. Wood-Preservers' Assoc. Proc., 33* (*1937*), *pp. 279–292*).—This is a progress report on the performance of wood specimens treated with various chemicals and exposed to the activities of termites in Australia, Barro Colorado Island (Canal Zone), Hawaii, and South Africa, the details of which are given in six tables.

The effect of temperature on locust activity, M. Hussein (*Egypt Min. Agr., Tech. and Sci. Serv. Bul. 184* (*1937*), *pp. V+55, pls. 13, figs. 3*).—Experiments conducted with *Locusta migratoria migratorioides* (R. & F.), *Schistocerca gregaria* (Forsk.), and *Nomadacris septemfasciata* (Serv.) in Egypt are reported, accompanied by a list of 15 references to the literature. A preface by B. P. Uvarov is included.

Preparation and method of application of the zinc phosphide bait employed in the control of the mole-cricket (Gryllotalpa), A. Kassab (*Egypt Min. Agr., Tech. and Sci. Serv. Bul. 178* (*1936*), *pp. 12, pls. 8*).—The use of a

zinc phosphide bait against mole crickets is said to have given satisfactory results and been adopted as an effective remedy. The formula employed consisted of crushed maize or rice 100 parts, water 25 parts, and zinc phosphide 5 parts.

Thysanoptera of Iowa, F. ANDRE (*Iowa State Col. Jour. Sci., 12 (1937), No. 1, pp. 104, 105*).—This paper brings together 87 species of Thysanoptera which have been recorded as occurring in Iowa and contains keys for their separation. A study of the food plants from which the species are ordinarily collected has been made.

The control of citrus thrips, Scirtothrips aurantii Faure, in Southern Rhodesia, E. PARRY JONES (*Brit. So. Africa Co. Pub. 4 (1936), pp. 11–20*).—The citrus thrips (*S. aurantii*) of South Africa is said to have been successfully controlled in Southern Rhodesia during the last 5 yr. by the application of 1 percent lime-sulfur spray, a second application being made after a lapse of 10 days. Experimental field work from 1931 to 1933 is reported upon.

Studies of certain phases of the biology of the chinch bug (Blissus leucopterus (Say)) under conditions of constant temperature and constant relative humidity, M. J. JANES (*Iowa State Col. Jour. Sci., 12 (1937), No. 1, pp. 132, 133*).—An abstract of a further report of work conducted in Iowa (E. S. R., 76, p. 828), presented as a doctoral thesis.

Variations in nymphal populations of the potato leafhopper on different varieties of potatoes, J. P. SLEESMAN and J. BUSHNELL. (Ohio Expt. Sta.). (*Amer. Potato Jour., 14 (1937), No. 8, pp. 242–245*).—Population studies of the potato leafhopper made during the summer of 1936 yielded data, the details of which are presented in three tables. The number of nymphs varied significantly with the different varieties.

Effects of bordeaux mixture and pyrethrum dust on leafhopper control and yields of potatoes, E. O. MADER and F. M. BLADGETT (*Amer. Potato Jour., 15 (1938), No. 1, pp. 10–15*).—Experimental applications of bordeaux mixture and pyrethrum dust for control of the potato leafhopper in New York were made in such a way that the increases in yield due to the effect of copper on the plants could be separated from increases due to insect control. The nymphal control obtained from application of pyrethrum dust having been about equal in plats receiving different amounts of copper and those not sprayed with bordeaux mixture, it was apparent that the differences in the growth of vines and yields of potatoes could not have been due to leafhopper control. The rather consistent gains in foliage weight which followed the application of pyrethrum dust in addition to bordeaux mixture and ran through all the different amounts of copper sulfate applied from 0 to 144 lb. to the acre, as well as in all of the replications across the field, indicated that there was a real effect of the pyrethrum in increasing foliage weight. Thus it appears that pyrethrum, aside from its insecticidal value, exerts a stimulating effect on the growth of potato plants.

Relation of the curly top virus to the vector Eutettix tenellus, C. W. BENNETT and H. E. WALLACE (*Jour. Agr. Res. [U. S.], 56 (1938), No. 1, pp. 31–51, figs. 4*).—The results of the investigations to determine (1) the minimum time required for beet leafhoppers to pick up virus from diseased plants and (2) the influence of length of the feeding period on the percentage of fed leafhoppers that become viruliferous, conducted through 6 yr. at Riverside, Calif., are presented in 10 tables and 4 graphs, accompanied by a list of 20 references to the literature.

It was found that in a 1-min. feeding period nonviruliferous beet leafhoppers were able to acquire virus and viruliferous leafhoppers were able to transmit

it. However, the minimum time for acquisition and transmission by a single individual was 4 hr. A 48-hr. period was sufficient for acquisition of enough virus for maximum infective ability, but longer periods were required for leafhoppers to acquire maximum charges of virus. Six-min. feedings preceded by fasting periods of from 15 min. to 3 hr. gave more infection than feedings which were preceded by longer or shorter fasting periods.

Virus was obtained from the blood, salivary glands, feces, and alimentary tract of leafhoppers. The relative quantity of virus recovered from blood indicates this is the chief virus reservoir in the insect. Regardless of size of the initial charge of virus in leafhoppers their virus content decreased when they were confined to immune plants. Leafhoppers having a low initial charge of virus lost ability to transmit in 54 days or less when transferred daily on beet but reacquired this ability when allowed to feed on curly top beets. This evidence indicates that the virus does not increase in the vector.

Individual beet leafhoppers vary greatly in their ability to transmit virus. Two races differing markedly in their ability to transmit were developed by selection and breeding but no race totally lacking in this ability was obtained. Eight nonvector species of insects obtained virus by feeding on diseased plants. After these species were removed to healthy plants they retained the virus for periods ranging from less than 1 day (*Hercothrips femoralis* Reut.) to 21 days (*Aceratagallia californica* Baker).

Observations on the biology of certain British Psyllidae, G. H. Harrison (*Entomologist, 69 (1936), No. 879, pp. 175–177; 70 (1937), No. 886, pp. 49–52*).—Observations made during the course of the collecting and breeding of Psyllidae, representing six genera, including their hibernation, host, and shelter plants, hitherto unrecorded, are here presented.

Macrosiphum aphids infesting Chrysothamnus and Gutierrezia, C. F. Smith and G. F. Knowlton. (Utah Expt. Sta.). (*Canad. Ent., 69 (1937), No. 12, pp. 269–272, fig. 1*).—Notes are presented and tables given for the separation of seven species, of which one from *Gutierrezia* sp. is described as new under the name *M. zerogutierrezis*.

Notes on western conifer aphids (Homoptera: Aphididae), G. F. Knowlton and C. F. Smith. (Utah Expt. Sta.). (*Ent. News, 49 (1938), No. 3, pp. 65–69, figs. 27*).—In this further contribution two species and a subspecies of conifer aphids are described as new, namely, *Cinara thatcheri* from *Pinus ponderosa* at White Bird Summit, Idaho, *C. utahensis* from *Abies lasiocarpa* in Smithfield Canyon, Utah, and *C. utahensis zoolathridi* from spruce in a nursery at Portland, Oreg.

The experiments in Wisconsin against pea aphids in 1937, J. E. Dudley, Jr., and T. E. Bronson. (U. S. D. A. coop. Wis. Expt. Sta.). (*Canner, 85 (1937), No. 25, pp. 15, 16*).—The application of derris and cube dust mixtures with various conditioning agents in experimental work in Wisconsin in 1937 resulted in a reduction in pea aphid infestation amounting to over 90 percent and frequently attaining 97 or 98 percent. The increases in yields were greater where the derris or cube dust mixtures containing various conditioning agents were applied than in any of the other treatments. In similar tests nicotine dust did not control the pea aphid to a satisfactory degree.

Aphids in tobacco, A. J. Smith (*Farming in So. Africa, 12 (1937), No. 138, pp. 369, 381, fig. 1*).—A brief account is given of the life history and control of the peach aphid of South Africa, which is said to have caused a surprising amount of damage to the tobacco crop in the past few years.

Aleyrodidae of Formosa, I–IV, R. Takahashi (*Formosa [Taiwan] Govt. Res. Inst. Dept. Agr. Rpts. 59 (1932), pp. [3]+57, figs. 34; 60 (1933), pp. 1–24,*

figs. 15; 63 (1934), pp. 39–71, figs. 22; 66 (1935), pp. 39–65, figs. 17).—Part 1 of this contribution deals with 60 species known at the time to occur in Taiwan, a large proportion of which were new to science, and gives a food plant catalog of these forms, together with a bibliography of 3 pages. Part 2 embodies notes on the food habits of these insects and records and descriptions of 17 species, of which 14 are described as new. A further list of the host plants and a description of a new species infesting mulberry in Loochoo are also included. Part 3 presents descriptions of 24 new species and records 2 species hitherto unknown from Taiwan found on both cultivated and wild plants. A further list of food plants of Taiwan Aleyrodidae is included. Part 4 presents descriptions of 16 species and 2 varieties new to science and records 2 additional species not heretofore reported as occurring in Taiwan. It is considered noteworthy that the citrus white fly has been found on native citrus growing wild in the mountainous regions in the island, and several species have been found for the first time on mulberry, peach, persimmon (*Diospyros kaki*), and other cultivated plants. A supplementary list of the new food plants of Taiwan Aleyrodidae is included.

Nosema disease of Cactoblastis, L. B. RIPLEY (*Farming in So. Africa, 12 (1937), No. 137, pp. 325, 345*).—A report is made of work with the hitherto unknown nosema disease of the cactus-eating caterpillar *C. cactorum* Berg., an insect introduced into Cape Province from Australia to combat the pricklypear, which now covers some 4,000,000 acres.

Studies in the life history of the citrus mussel scale Lepidosaphes pinnaeformis Bché. in Palestine, F. S. BODENHEIMER and H. STEINITZ (*Hadar, 10 (1937), No. 7–8, pp. 153, 155–159, figs. 3*).—Report is made of a study of the biology of *L. pinnaeformis*, which has spread from its original home in tropical America and occurs in practically all countries where citrus is grown and even beyond, the details being given in tables.

Observations on the Coccidae of Formosa, III–V, R. TAKAHASHI (*Formosa [Taiwan] Govt. Res. Inst., Dept. Agr. Rpts., 60 (1933), pp. 25–64, figs. 16; 63 (1934), pp. 1–38, figs. 24; 66 (1935), pp. 1–37, figs. 27*).—These contributions describe additional forms (E. S. R., 65, p. 248), 9 varieties and 36 species being recognized as new to science. Part 3 presents a food plant catalog of the Taiwan Coccidae (supplement 2), descriptions of new or little-known Taiwan Coccidae with 12 new species and a new species of *Chrysomphalus* from Loochoo, and a list of species recorded from Taiwan since the publication of part 2 of this series, and part 4 new or little-known Taiwan Coccidae with 12 new species and 4 new varieties and a list of new food plants of Taiwan Coccidae. In part 5 a new genus (*Paracardiococcus*) is erected and 11 species and 5 varieties are described as new. Notes on some forms new to or already known from Taiwan and some natural enemies are given, together with a list of new food plants in the island.

Some notes on the natural enemy, sexuality, and other characteristics of the paddy skipper Parnara guttata Bremer observed during the autumn of 1936, Nanking, P. H. TSAI and N. M. CHUN (*Ent. & Phytopath. [Bur. Ent., Hangchow, China], 5 (1937), No. 14, pp. 262–273, figs. 9; Eng. abs., pp. 272, 273*).—An account of the so-called paddy skipper *P. guttata*, which causes enormous loss each year in the rice-growing regions of China, particularly in Kiangsu, Chekiang, and Anhwei.

Notes on the investigation of the pine caterpillar (Dendrolimus sp.) in the Forestry Experiment Station, Li Shui Hsien, Chekiang, LUI HO-CHANG (*Ent. & Phytopath. (Bur. Ent., Hangchow, China], 5 (1937), No. 13, pp. 240–246, fig. 1; Eng. abs., p. 246*).—A brief account of a pine caterpillar of the genus

Dendrolimus, which has become a very serious pest in Chekiang during the last 2 yr. Natural enemies observed include the braconid parasite *Rhogas spectabilis*, the ichneumonid parasite *Rhythmonotus* sp., a reduviid, and a fungus disease.

Paradichlorobenzene-oil preparations for control of peach tree borer, M. L. Robb and W. S. Hough. (Va. Expt. Sta.). (*Va. State Hort. Soc. Rpt., 42 (1937), pp. 74–82*).—In orchard experiments with paradichlorobenzene for peach borer control, conducted in Albermarle and Frederick Counties in 1936 and 1937, a summary of which is presented in tables, it was found that fall applications of this insecticide should be made in northern Virginia between September 15 and October 1 and in eastern and southern Virginia between September 25 and October 10. If spring applications are made they should be made early in May.

"Fall treatments are more effective than spring treatments. The spraying method of treatment was generally slightly more effective than the crystal-ring method of treatment. The trees should be mounted after the application in order to get the maximum kill of borers. The mound around trees 3 yr. of age and younger should be leveled off about 4 weeks after treatment. Those around older trees may be left all winter but should be removed before July 1. When paradichlorobenzene is dissolved in any of the recommended oil carriers, the cost of the treatment will be almost double that of the crystal-ring method."

Studies on the red bollworm of cotton Diparopsis castanea Hampson.—I, The distribution and ecology of two natural food-plants, Cienfuegosia hildebrandtii Gürke and Gossypium herbaceum var. africana Watt, J. Marshall, F. S. Parsons, and H. Hutchinson (*Bul. Ent. Res., 28 (1937), No. 4, pp. 621–632, pls. 3*).—The principal results of a survey undertaken with the objects of ascertaining the extent of the natural breeding areas of the red bollworm *D. castanea* in South Africa and whether the habitats of the food plants are well defined ecologically are considered in this first contribution.

Some pink bollworm studies in Egypt, I. Bishara (*Egypt Min. Agr., Tech. and Sci. Serv. Bul. 163 (1936), pp. [5]+32, pls. 27*).—This is a report of studies dealing mainly with the relative importance of the various sources of infestation of the new crop of cotton.

Investigations on the cotton boll worm, Heliothis obsoleta Fabr., E. Parry Jones (*Brit. So. Africa Co. Pub. 4 (1936), pp. 21–82, pls. 2, figs. 3*).—A study of the bionomics (pp. 26–61) and control (pp. 62–81) of the cotton bollworm, conducted at the Mazoe Citrus Experiment Station, is reported upon, details being given in 20 tables.

A preliminary investigation into cane varieties and infestation by Diatraea saccharalis, R. W. E. Tucker (*Agr. Jour. [Barbados], 5 (1936), No. 4, pp. 121–142*).—An account is here given of preliminary field experiments conducted in 1934 on the 1933–35 varietal maturity plats. The results of this work show that it may be possible by more extended investigations to determine the factors which produce the now recognized varietal differences in sugarcane borer infestation, and so open up the possibilities of cane breeding stations incorporating resistance to sugarcane borer infestation into breeding programs. Indications as to the factors concerned are given and data set out which show that varietal changes and proportional plantings thereof are likely to have caused a slight rise in average infestation during the past two or more years in Barbados.

The Phalaenidae of Mississippi—morphology of the genitalia, R. E. Hutchins (*Iowa State Col. Jour. Sci., 12 (1937), No. 1, pp. 127–131*).—An abstract of a doctoral thesis on the genitalia of the Phalaenidae (Noctuidae) of Missis-

sippi, from which State 182 species representing 108 genera have been recovered. The illustration and description of the major groups of these important moths are said to render their identification comparatively simple.

Aquatic Diptera, IV, V *([New York] Cornell Mem. 210 (1937), pp. 80, pls. 18)*.—Two further contributions are presented (E. S. R., 78, p. 372). Part 4 (pp. 3–56), Chironomidae: Subfamily Chironominae, by O. A. Johannsen, gives descriptions with keys to the genera and species of the Chironominae, a list of 41 references to the literature, and supplementary notes to parts 1, 2, and 3 of Aquatic Diptera. Part 5 (pp. 57–80), Ceratopogonidae, by L. C. Thomsen, follows a brief introduction which includes methods of collecting and rearing the flies and descriptions of and keys to the eggs, larvae, and pupae with descriptions of the genera and species of Ceratopogonidae, including tables for the identification of the larvae and pupae. A list is given of 16 references to the literature.

A preparatory investigation on the cause of the behaviour of Anopheles maculipennis in the choice of food, J. Reuter *(Acta Leiden. Scholae Med. Trop., 10–11 (1935–36), pp. 260–267)*.—A discussion relating to the zoophilic and anthropophilic preferences of *Anopheles* species in general and biotypes of the malaria mosquito *A. maculipennis* in particular.

A preliminary list of the Tabanidae (Diptera) of Florida, G. B. Fairchild. (Fla. Expt. Sta.). *(Fla. Ent., 19 (1937), No. 4, pp. 58–63; 20 (1937), No. 1, pp. 10, 11)*.—Sixty-five forms of horseflies, representing seven genera and subgenera, are listed. One species and two varieties are described as new to science.

Warble fly.—Experiments, 1935 *([Irish Free State] Dept. Agr. Jour., 34 (1936), No. 1, pp. 133–136)*.—The use of two derris preparations in control work with warble fly grubs is reported upon. A 98 percent kill was obtained with the commercial preparation Polvo, applied at the rate of 0.5 lb. to 0.25 lb. of soft soap and 1 gal. of water, and 97 percent kill from the commercial preparation Paragad, applied at the rate of 0.5 lb. to 1 gal. of water.

The role of the housefly in the propagation of Trichomonas intestinalis in man [trans. title], T. Simitch and D. Kostitch *(Ann. Parasitol. Humaine et Compar., 15 (1937), No. 4, pp. 323–325)*.—It is concluded that the housefly may serve as an intermediate host in the propagation of *T. intestinalis* in man and susceptible animals.

Sheep blow-fly investigations, V, VI, R. P. Hobson *(Ann Appl. Biol., 24 (1937), Nos. 3, pp. 627–631; 4, pp. 808–814)*.—Further work (E. S. R., 77, p. 370) is reported.

V. *Chemotropic tests carried out in 1936.* An account is given of tests of 42 organic substances as repellents for the sheep maggot fly *Lucilia sericata* Meig. "Repellency was measured by observing the ability of added substances to counteract the attraction of a solution of ammonium carbonate and indole placed in the fleece of a sheep. The substances tested were classified into three groups: (1) Repellent at 0.3 percent (amount added to attractant solution), (2) repellent at 0.9 percent, (3) not repellent at 0.9 percent. No substance was found which was repellent at 0.1 percent.

"Examination of blowflies (*L. sericata*) trapped when approaching sheep treated with indole and ammonium carbonate showed that only gravid females are attracted. This chemotropic response depends, therefore, not only on the species, but also on the sex and physiological condition of the fly."

VI. *Toxicity of stomach poisons to sheep maggots.*—Under laboratory conditions arsenic was the only material which rendered the fleece poisonous for an appreciable period.

Fruit fly investigations in east Africa, F. A. BIANCHI and N. H. KRAUSS (*Hawaii. Planters' Rec.* [*Hawaii. Sugar Planters' Sta.*], *41 (1937), No. 4, pp. 299–306*).—The work of the East African Fruitfly Expedition undertaken by the authors for the U. S. Department of Agriculture during the latter part of 1935 and the first half of 1936 is summarized. The findings in the four countries visited during the course of the work are reported under the headings of Tanganyika, Zanzibar, Kenya, and Uganda. The observations as relate to the fly-infested fruits of Kenya and the parasites reared are summarized in table form.

A contribution to the biology of the beet fly Pegomyia betae [trans. title], J. H. VIVIEN (*Bul. Biol. France et Belg., 71 (1937), No. 3, pp. 322–356, figs. 2*).—The morphology and the biology of the several stages of *P. betae*, the number of generations, the influence of environment, the effect upon the host, and the nature and frequence of parasites observed are considered in this report of a study of this beet fly. A list of 28 references to the literature is included.

The asparagus miner (Melanagromyza simplex H. Loew) (Agromyzidae; Diptera), H. F. BARNES (*Ann. Appl. Biol., 24 (1937), No. 3, pp. 574–588, pls. 2, fig. 1*).—This contribution from the Rothamsted Experimental Station deals with the history and identification, morphology, distribution, bionomics, parasites, and control of the asparagus miner. It was first described in 1869 from the United States, where it was first associated with asparagus in 1896 by Sirrine (E. S. R., 13, p. 159), and recognized in Europe about the same time. The braconid parasite *Dacnusa ?bathyzona* Marsh., a pteromalid (*Sphegigaster* sp.), and a eulophid (*Pleurotropis epigonus* Walk.) were reared from it.

A list of 22 references to the literature is included.

Dipterous parasites of spider egg sacs, B. J. KASTON and G. E. JENKS (*Bul. Brooklyn Ent. Soc., 32 (1937), No. 4, pp. 160–165, figs. 21*).—A review of the literature on dipterous parasites of spider egg sacs, with a list of 16 references, is followed by a report of observations of *Pseudogaurax anchora* (Loew), reared from an egg sac of *Argiope aurantia* collected at Westport, Conn.

The introduction and colonization in Puerto Rico of predatory beetles which attack coconut scales, K. A. BARTLETT (*Puerto Rico Sta. Agr. Notes No. 84 (1938), pp. 9*).—A report is made of the results of introductions of predatory beetles from Trinidad and Brazil to combat the coconut scale *Aspidiotus destructor* Sign., an account of exploratory work with which by Dohanian has been noted (E. S. R., 77, p. 508). The named species, details of the liberations of which are given in table form, include *Azya trinitatis* Marsh., *Cryptognatha nodiceps* Marsh., *C. simillima* Sicard, *Pentilia castanea* Muls., and *Scymnus aeneipennis* Sicard from Trinidad and *Coccidophilus citricola* Breth. and *P. egena* Muls. from Brazil.

Notes on a new species of Pyrophorus introduced into Hawaii to combat Anomala orientalis Waterhouse, F. A. BIANCHI (*Hawaii. Planters' Rec.* [*Hawaii. Sugar Planters' Sta.*], *41 (1937), No. 4, pp. 319–333, figs. 3*).—The introduction from Guatemala and the morphology and biology of the elaterid beetle *P. bellamyi* Van Zwaluwenberg 1936,[1] the larvae of which are predaceous, to combat the oriental beetle are reported upon. Although neither adults nor larvae have been recovered in the field since their introduction into the Hawaiian Islands in 1934 and 1935, it is thought that the larvae will eventually become an important factor in the control of white grubs, both of *Anomala* and *Adoretus*.

[1] Hawaii. Ent. Soc. Proc., 9 (1936), No. 2, pp. 231–234, fig. 1.

The introduction of the Chinese ladybeetle in citrus groves, J. R. WATSON (*Fla. State Hort. Soc. Proc., 49 (1936), pp. 40–43*).—This contribution has been noted from another source (E. S. R., 76, p. 665).

Certain biological studies on Phyllophaga (Coleoptera: Scarabaeidae) in Iowa, B. V. TRAVIS (*Iowa State Col. Jour. Sci., 12 (1937), No. 1, pp. 161–163*).—An abstract of a doctoral thesis on May beetles of the genus *Phyllophaga*, based on studies conducted in Iowa.

On the effect of short radio waves upon the life activity of cockchafer larvae, A. V. LUGOVOJ (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 4 (1936), No. 7, pp. 311–314, figs. 2*).—It is pointed out that the use of tractors and automobiles in field and forest work has set up conditions for the utilization of high freqnency currents in combating cockchafers and other underground insects injurious to cultivated plants. The future of this method is dependent upon the least possible expenditure of power, which may be obtained by paralyzing larvae for periods of time not exceeding 1 to 2 sec.

Wireworm control for Maine potato growers, J. H. HAWKINS (*Amer. Potato Jour., 14 (1937), No. 11, pp. 351–354*).—This contribution from the Maine Experiment Station reports upon investigations already noted (E. S. R., 75, p. 817).

Temperature and moistnre preferences of wireworms, R. E. CAMPBELL (*Ecology, 18 (1937), No. 4, pp. 479–489, figs. 3*).—A study made of the temperatures and moisture content of soil preferred by wireworms is reported. The experiments show that the temperature preferendum varies with the season, being higher in the summer and fall than in the winter and spring. There is also a lag behind the soil temperature, indicating that the preferendum does not change until the wireworms have been subjected to the higher or lower temperatures for a month or more. In low temperatures wireworms become inactive, but high temperatures are also unfavorable, the wireworms quickly moving to a more favorable environment. Finally, there is a rather wide range of temperature in which wireworms are active. While dry soil has the greatest effect in causing the wireworms to move to a more favorable environment, the force of gravity exerts some influence, and when the wireworms are stimulated to activity by an unfavorable dry environment the natural trend of movement is downward.

Carpet beetles, E. A. BACK (*U. S. Dept. Agr. Leaflet 150 (1938), pp. 6, figs. 10*).—A practical account.

Control of the potato flea beetle (Epitrix cucumeris Harris) on the Eastern Shore of Virginia, L. D. ANDERSON and H. G. WALKER. (Va. Truck Expt. Sta.). (*Amer. Potato Jour., 14 (1937), No. 10, pp. 319–325*).—This contribution is based upon work reported in Bulletin 92 (E. S. R., 77, p. 371).

The raspberry beetle Byturus tomentosus and its control, J. CARROLL (*[Irish Free State] Dept. Agr. Jour., 34 (1936), No. 1, pp. 119–123*).—Tests conducted in the Irish Free State have led to the conclusion that *B. tomentosus* can be successfully controlled by the use of derris, thus confirming the conclusions arrived at in England by Harper Gray and Brooks (E. S. R., 74, p. 376).

Notes on the habits and control measures of the Alissonotum beetles injurious to sugar cane in Formosa, M. YANAGIHARA (*Govt. Sugar Expt. Sta., Formosa [Taiwan], Rpt., 2 (1935), pp. 111–136, figs. 7; Eng. abs., pp. 134–136*).—These notes relate to the most important cane pests in the south of Taiwan, namely, *A. crassum* Arr., *A. impressicolle* Arr., and *A. pauper* Burm., their morphology, life history, natural enemies, and control measures.

The control of white stem borer of coffee, R. M. DAVIES (*East African Agr. Jour., 2 (1937), No. 4, pp. 293–297*).—Observations in Northern Province,

Tanganyika, of *Anthores leuconotus* Pasc., which is able to cause widespread damage to coffee at elevations below 4,500 ft., are reported upon.

Studies of the biology of the death-watch beetle Xestobium rufovillosum DeG.—I, A summary of past work and a brief account of the developmental stages, R. C. Fisher (*Ann. Appl. Biol., 24 (1937), No. 3, pp. 600–613, figs. 5*).—This contribution, presented with a list of 37 references to the literature, is intended to form an introduction to a short series of studies of the biology of the death-watch beetle *X. rufovillosum*. The status of the insect as a pest in England is discussed, and a review of its life history and habits presented with a list of 37 references to the literature.

Program for control of the plum curculio on peach, A. M. Woodside. (Va. Expt. Sta.). (*Va. State Hort. Soc. Rpt., 42 (1937), pp. 95–100*).—A contribution from the Staunton field laboratory.

The Rhynchophora of Iowa, G. G. Bleasdell (*Iowa State Col. Jour. Sci., 11 (1937), No. 4, pp. 405–445*).—An annotated list is given of 462 species of weevils definitely shown to occur within the State of Iowa; published records of 48 others from surrounding States indicate their probable occurrence in Iowa.

Studies on European foul brood of bees.—III, Further experiments on the production of the disease, H. L. A. Tarr (*Ann. Appl. Biol., 24 (1937), No. 3, pp. 614–626, pl. 1*).—In this further contribution from the Rothamsted Experimental Station (E. S. R., 77, p. 76) evidence is submitted which supports the theory that European foulbrood is a single disease caused by *Bacillus pluton* White. The course of the disease can be modified by introducing cultures of certain secondary invading bacteria into colonies of bees infected with *B. pluton*. A certain "mass inoculum" of *B. pluton* organisms is required to induce the disease in healthy colonies. The causal organism is present in virulent form in the rectal ampullae of young bees in affected colonies, but does not appear to exist elsewhere in the bee or to multiply in its intestinal tract. It appears as if *B. pluton* is a strict parasite which will only multiply in the intestines of young larvae.

A preliminary list of Chinese inquiline humblebees (Hym., Psithyridae), T. Ma (*Ent. & Phytopath.* [*Bur. Ent., Hangchow, China*], *5 (1937), No. 14, pp. 273–275*).—A tentative list of 27 species and varieties of Chinese inquiline bumblebees is presented.

The life-history and habits of the digger-wasp Ammobia ichneumonea (Linn.), J. A. Frisch (*Amer. Midland Nat., 18 (1937), No. 6, pp. 1043–1062*).—Notes on the species of grasshopper prey of this wasp are included in the work reported.

The prepupal stage in Ichneumonidae, illustrated by the life-history of Exenterus abruptorius Thb., K. R. S. Morris (*Bul. Ent. Res., 28 (1937), No. 4, pp. 525–534, figs. 4*).—The life history of *E. abruptorius*, an important parasite of the pine sawfly *Diprion sertifer* Geoff., which, like its host, is univoltine, is considered. "It oviposits on the last stage larva or prepupa and only hatches after the host has spun its cocoon. Only one-quarter of the primary larvae develop immediately, the remainder resting up to 2½ mo. during the summer before proceeding with their development. On the completion of feeding the parasite larva spins its cocoon within the host cocoon and enters the prepupal stage, which can be divided into two distinct phases, eonymphal and pronymphal. Hibernation is always in the eonymphal stage. In Sweden 37 percent of this species remained in hibernation for two winters, but in Hungary all emerged in the spring following the year of development. Further than this, in Sweden the sexes were in approximately equal proportion; in Hungary

females exceeded males by four to one. This may indicate the existence of biological races."

Notes on two hymenopterous parasites of Pieris rapae Linn., M. CHIN (*Ent. & Phytopath. [Bur. Ent., Hangchow, China], 4 (1936), No. 30, pp. 592–600, figs. 2; Eng. abs., pp. 598–600*).—These notes relate to *Pteromalus puparum* L. and *Brachymeria* (*Chalcis*) *obscurata* Walk., two important enemies of the pupa of the imported cabbageworm.

A list of the known hymenopterous parasites of the European corn borer (Pyrausta nubilalis Huebner), J. T. CHU and S. H. HSIA (*Ent. & Phytopath. [Bur. Ent., Hangchow, China], 5 (1937), No. 8, pp. 136–147; Chin. abs., p. 147*).—A list of 77 species of parasites of the European corn borer, including 13 known to occur in China, together with their distribution and hosts. This borer is a serious enemy of corn, grain sorghum (kaoliang), millet, and also other economic plants in China. A list is given of 55 references to the literature.

The introduction into Puerto Rico of a parasite of the white scale of papaya, K. A. BARTLETT (*Puerto Rico Sta. Agr. Notes No. 85 (1938), pp. 2*).—A brief account is given of the introduction of the hymenopterous parasite *Prospaltella berlesei* (How.) from Louisiana in 1936 and 1937 to combat the white peach scale in Puerto Rico, where it is a destructive enemy of papaya and attacks other economic and ornamental plants.

Sawfly biologies.—II, Hemichroa crocea Geoffroy, G. R. HOPPING (*Canad. Ent., 69 (1937), No. 11, pp. 243–249, fig. 1*).—In this second contribution (E. S. R., 75, p. 819) studies of the sawfly *H. crocea*, which attacks the alder (*Alnus rubra*) and may cause severe defoliation, are reported upon.

The pallid mite or cyclamen mite, a serious delphinium pest, W. E. BLAUVELT (*Delphinium [Amer. Delphinium Soc.], 1936, pp. 29–34, fig. 1*).—A summary of information is given on the cyclamen mite, which causes widespread and serious injury to delphinium, and a brief reference to the broad mite, which has been reported from delphinium in the greenhouse as well as many other greenhouse plants.

The biology of the garden centipede (Scutigerella immaculata), A. E. MICHELBACHER (*Hilgardia [California Sta.], 11 (1938), No. 3, pp. 55–148, figs. 29*).—Studies conducted by the author, together with information gained from the literature, a 13-page list of references to which is included, are presented in this contribution, the details being given in 10 tables.

This centipede, which is one of 54 known species of Symphyla of the world, molts from time to time during its entire life, and, since it may live for a period of 4 yr. or longer, the maximum number of molts may exceed 50. It appears to be a vegetable feeder and prefers succulent materials, although it feeds on many kinds of lower plant life. In certain areas it is a serious pest of cultivated crops. Under field conditions flooding is the most satisfactory method of controlling it. Suitable methods for checking damage in greenhouses consist in using raised benches, in steam treatment, and soil fumigation. True centipedes, or chilopods, are among the most important natural enemies. The garden centipede is not restricted to any particular soil level and may be found from the surface to a depth of 4 ft. or more. Moisture seems to be the most important factor determining its vertical distribution.

Earlier accounts by the author of its economic status (E. S. R., 74, p. 525) and chemical control (E. S. R., 69, p. 87) have been noted.

Experimental studies on Echinostoma revolutum (Froelich), a fluke from birds and mammals, P. C. BEAVER (*Ill. Biol. Monog., 15 (1937), No. 1,*

pp. 96, figs. 54).—This is a report on the life history and morphology of a trematode, the adults of which for the first time have been successfully transferred from mammal to bird hosts. A bibliography of five pages is included.

ANIMAL PRODUCTION

The physiology of domestic animals, H. H. Dukes (*Ithaca, N. Y.: Comstock Pub. Co., 1937 4. ed. rev., pp. XIV+695, figs. 167*).—The fourth edition of this book (E. S. R., 74, p. 527) is noted. In prefacing remarks it is stated "in preparing material for this edition two principal considerations have been kept in mind: To give the book a thoroughgoing revision in keeping with recent advances in physiology, and to make substantial expansions in a number of places where the text seemed too brief."

Growth and development with special reference to domestic animals.—XLIII, Diurnal metabolic and activity rhythms, V. V. Herring and S. Brody (*Missouri Sta. Res. Bul. 274 (1938), pp. 30, figs. 9*).—Continuing this series (E. S. R., 78, p. 84), the authors review the literature on diurnal rhythms of various types and in different species of animals and present the results of a study on diurnal metabolic variations in the rat.

The metabolic peak in the rat occurred at night (usually before midnight) and was from 25 to 30 percent greater than the minimum metabolic rate which was reached during the day (usually before noon). This type of metabolic rhythm was not extinguished by a month of continuous lighting or by feeding at 3-hr. intervals, but was extinguished by 1 week of continuous lighting together with the frequent feeding. Other types of rhythms associated with various physiological processes and which complicate investigation of factors influencing metabolic rates are described.

The determination of the digestibility of crude protein by artificial methods [trans. title], P. Schwarze (*Biedermanns Zentbl., Abt. B, Tierernähr., 9 (1937), No. 4–6, pp. 346–354; Eng. abs., pp. 353, 354*).—The digestibility of the crude protein in alfalfa plants, various legume seeds, and the grains of rye, barley, and corn as determined by artificial digestion with pepsin-hydrochloric acid and pancreatin-soda mixtures are presented in this report. This method was used in ascertaining the protein digestibility in forage crop breeding material.

Further evidence of the relation of dietary protein to sterility, I. J. Cunningham, C. S. M. Hopkirk, and M. M. Cunningham (*New Zeal. Jour. Sci. and Technol., 19 (1937), No. 1, pp. 22–30*).—Continuing this investigation (E. S. R., 74, p. 676), when the corn in the basal serility-producing diet of rats was entirely replaced by wheat, rye, or barley normal testes were produced, whereas substitution of the corn by oats produced the same effect as the corn diet. Variable results were obtained when varying quantities of dried bull testes, dried salmon testes, dried yeast, and Marmite were added to the basal ration in such a manner as to alter the quality of the protein without affecting its quantity. The results indicated that the quality of the dietary protein is of prime importance in the development and functioning of rat testes.

The viamin A value of blue grama range grass at different stages of growth, M. C. Smith and E. B. Stanley (*Jour. Agr. Res.* [*U. S.*], *56 (1938), No. 1, pp. 69–71*).—The Arizona Experiment Station determined (by the rat-growth method) the vitamin A content of blue grama range grass (*Bouteloua gracilis*). Three sets of samples taken at different stages in the growth of the plant were assayed. Samples cut in August were very potent in vitamin A, as indicated by the fact that only 0.05 percent of the dry grass in the vitamin

A-free diet induced average gains of 6.5 g per week in the test rats. Approximately twice as much grass cut in September and 100 times as much cut in November were necessary to produce the same rate of gain. Apparently the period of the year during which range cattle would receive sufficient vitamin A from such grass to build up a reserve body supply is rather short.

The value of amides in the ration of cattle [trans. ttile], K. KREBS (*Biedermanns Zentbl., Abt. B, Tierernähr.*, *9 (1937), No. 4-6, pp. 394-507; Eng. abs., pp. 496-498, Fr. abs., pp. 498-500*).—This report presents a historical consideration of the ability of nonprotein nitrogen to replace protein in the diet, a critical examination of the results of numerous experiments, and a discussion of trials dealing with the effect of substituting urea and glycocoll for protein in the ration of cattle. In the opinion of the author the system of rationing farm animals based on the digestible crude protein is erroneous, since the function of the nonprotein nitrogen fraction is not comparable to the true protein. Although nonprotein nitrogen must be taken into account it should be clearly distinguished from protein nitrogen. One hundred and twenty-six references to the literature are cited.

Replacing protein by urea in the ration of growing cattle [trans. title], G. FINGERLING, B. HIENTZSCH, H. KUNZE, and K. REIFGERST (*Landw. Vers. Sta., 128 (1937), No. 3-4, pp. 221-235*).—A series of nitrogen balance trials with steers in which wheat gluten and urea were each fed as supplements to a low protein basal ration gave evidence that from 50 to 61 percent of the nitrogen in urea was utilized by the animals as compared with from 60 to 63 percent of the nitrogen in the gluten fed. Evidently urea within reasonable limits can be utilized by growing animals, and its use as a protein substitute in animal feeding seems justified.

The growth of micro-organisms on ox muscle, I, II, W. J. SCOTT (*Jour. Council Sci. and Indus. Res. [Austral.], 9 (1936), No. 3, pp. 177-190, figs. 8; 10 (1937), No. 4, pp. 338-350, figs. 4*).—Two phases of this study are noted.

I. *The influence of water content of substrate on rate of growth at —1° C.*—A method is described for determining the rate of growth at —1° of micro-organisms on slices of ox muscle, the water contents of which were in equilibrium with the water vapor tension of the storage atmosphere. Trials with seven organisms capable of rapid growth on moist beef muscle at —1° gave evidence that the critical water contents of muscle expressed as a percentage of the dry weight were between 140 and 180 for two strains of *Pseudomonas*, between 85 and 90 for two strains of *Achromobacter*, and between 45 and 55 for three strains of asporogenic yeasts. These values correspond to relative humidities of approximately 98, 96, and 91 percent, respectively. The practical application of these results is discussed.

II. *The influence of temperature.*—Further studies of the critical water contents of ox muscle for bacterial growth showed that there was no marked change in these values within a range of —1° to +4°. Data are presented on the growth rates of these same micro-organisms at various temperatures ranging from —1° to +30°.

Effects of mineral deficiencies in animals, B. W. FAIRBANKS (*North Amer. Vet., 18 (1937), No. 10, pp. 15-20*).—The effects of magnesium and iodine deficiencies in the animal diet are summarized in this further report (E. S. R., 78, p. 674).

Fluorine storage in cattle bones, R. J. EVANS, P. H. PHILLIPS, and E. B. HART. (Wis. Expt. Sta.). (*Jour. Dairy Sci., 21 (1938), No. 2, pp. 81-84*).—Determination of the fluorine content in the bones of bovine fetuses of different ages and in veal-age calves gave evidence that a small amount of fluorine is

transferred through the placenta of the cow to the fetus, and that so long as milk is the main source of feed for calves their bones contain a relatively constant low quantity of fluorine. Average values of 32 and 190 p. p. m. of fluorine in the bones of veal calves and of cows on a low fluorine diet, respectively, showed that the chief storage of fluorine in the bones of cattle occurs after weaning. Appreciable quantities of fluorine were present in the organic matrix of the bones and in the cartilage.

The Denmark wasting disease: Cobalt status of some West Australian soils, R. J. HARVEY (*Jour. Dept. Agr. West. Austral., 2. ser., 14 (1937), No. 4, pp. 386–393, fig. 1*).—Data are presented on the cobalt content of a number of soils and pastures from various districts in Western Australia. In the Denmark district, where wasting disease was prevalent, the soils were markedly lower in cobalt than in districts unaffected by this disease or similar ailments. These results are considered to support the suggestion that a dietary deficiency of cobalt is the cause, and that soil cobalt determinations may be of considerable value in appraising the "soundness" of areas for livestock production.

The importance of cobalt in the treatment of certain stock ailments in the South Island, New Zealand, H. O. ASKEW and J. K. DIXON (*New Zeal. Jour. Sci. and Technol., 18 (1936), No. 2, pp. 73–92, figs. 9*).—Two series of experiments are reported in which groups of sheep suffering from bush sickness and from Morton Mains disease, respectively, were each cured by the administration of small quantities of cobalt as a drench. A review of previous tests in these herds on the use of certain drench materials, including soil drenches for the treatment of these diseases, indicated a close agreement between the cobalt content and the effectiveness of the drench.

The use of a cobaltized salt lick in the control of a lamb ailment at Morton Mains, Southland, J. K. DIXON (*New Zeal. Jour. Sci. and Technol., 18 (1937), No. 12, pp. 892–897, fig. 1*).—In further studies, a salt lick made by spraying a solution of 4 oz. of cobalt chloride in water on 1 ton of dairy salt gave excellent results in the control of Morton Mains lamb ailment. This method appeared to be equally as effective as the drench treatment described above and much less laborious.

The effect of feeding excess of cobalt to healthy sheep, S. W. JOSLAND (*New Zeal. Jour. Sci. and Technol., 19 (1937), No. 1, pp. 31–37*).—In the trials reported four ewes were drenched daily with 1 mg of cobalt in the form of cobalt sulfate over a period of 7 mo. Two of these ewes became slightly anemic, one developed an intense polycythemia, and one remained normal. Two young ewes receiving 5 mg of cobalt daily became severely anemic after 10 mo. of such treatment. Both produced normal lambs during this period. There was a small but definite storage of cobalt in the organs of these experimental ewes, but no evidence of a toxic effect was noted in the organs.

The rate of excretion of cobalt by sheep after drenching with cobalt chloride, H. O. ASKEW and S. W. JOSLAND (*New Zeal. Jour. Sci. and Technol., 18 (1937), No. 12, pp. 888–892*).—In the trials reported sheep were drenched with 4 mg of cobalt as cobalt chloride. Only 2 percent of the cobalt administered appeared in the urine, a large proportion of this being excreted within 24 hr. after drenching. The great bulk of the cobalt administered was excreted in the feces during the first 48 hr. after drenching. After 120 hr. the composition of both urine and feces had returned to normal. Apparently if absorption of cobalt is to be maintained at a high level such drenches must be repeated every three or four days.

Studies on the effect of a diet deficient in vitamin A on lungworm infestation in sheep, J. N. SHAW. (Oreg. Expt. Sta.). (*North Amer. Vet., 18 (1937),*

No. 10, pp. 25–27).—Wethers maintained on a diet deficient in vitamin A for a period of 19 mo. developed definite symptoms of avitaminosis, including night blindness, muscular incoordination, and urinary calculi, but did not show increased susceptibility to lungworm infestation as compared with normally fed controls.

The digestibility of some new urea-fodder mixtures [trans. title], K. NEHRING and W. SCHRAMM (*Landw. Vers. Sta., 128 (1937), No. 3–4, pp. 191–197*).—Mixtures of dried beet slices and urea 85 : 15 and wheat bran, molasses, and urea 70:15:15 were fed to wethers as supplements to a basal hay ration. The wethers consumed up to 200 g of these mixtures per head daily readily and with no ill effects. The organic matter (allowing for the urea present) was 82 and 85 percent digestible in the first and second mixtures, respectively, and when fed at the rate of 150 g per head daily with 600 g of hay increased the nitrogen retention 2 to 3 g and 1 g, respectively, over that on a ration of 800 g of hay.

The palatability and digestibility of new urea-fodder mixtures [trans. title], E. MANGOLD and H. STOTZ (*Landw. Vers. Sta., 128 (1937), No. 3–4, pp. 199–204*).—Mixtures of linseed meal and urea 85 : 15 and potato flakes and urea 85:15 each were palatable and highly digestible when fed as supplements to hay to sheep. The organic matter was 87.4 and 91.2 percent digestible, respectively.

The digestibility of a mixture of sliced beets and urea [trans. title], W. WÖHLBIER and C. WINDHEUSER (*Landw. Vers. Sta., 128 (1937), No. 3–4, pp. 205–210*).—Trials with sheep gave evidence that the urea in the above mixture was 100 percent digestible, while the sliced beets showed a normal digestibility.

The milk production of sows of the Mangalitza and Large White breeds and weight gains of the young pigs to 8 weeks of age [trans. title], D. CONTESCU, G. ROMAN, and T. BREABĂN (*Ztschr. Zücht., Reihe B, Tierzücht. u. Züchtungsbiol., 38 (1937), No. 3, pp. 367–374*).—The milk production of nursing sows over a period of 8 weeks as determined by weighing the pigs before and after suckling on one day of each week averaged 144.7 kg for 11 Mangalitza sows mostly over 4 yr. of age and 181.7 kg for 6 young Large White sows. Milk yields reached a maximum during the third week for the former and during the fourth week for the latter breeds, followed by a gradual decline in both breeds. Milk yields varied with the number of pigs per litter and with age of the sows. The milk yield per head of young was greater in the former breed. However, pigs of both breeds grew at about the same rate for the first 4 weeks, while during the fourth to eighth week the Large White pigs grew more rapidly than the Mangalitza pigs.

The evaluation of feeding stuffs used for pig fattening [trans. title], E. TEICHERT (*Landw. Jahrb., 84 (1937), No. 5, pp. 643–739*).—This paper presents a comprehensive review of recent experimental work (particularly in Germany) regarding the feeding value of a great variety of feeding stuffs for swine fattening. Various feeds discussed include plant and animal protein concentrates, rye, oats, dried alfalfa, root crops, potatoes, and feeding sugars, including wood sugar. An extensive bibliography and a table giving the average composition and digestible nutrients of various feeding materials are appended.

The crossbred as an export pig, R. BAKER (*Jour. Dept. Agr. So. Austral., 41 (1937), No. 5, pp. 446–456, figs. 3*).—This report presents data on the rate of gain and the feed consumption per unit of gain for groups of each of the following crosses: Large White × Tamworth × Berkshire (old type), Large White × Berkshire (old type), Tamworth × Berkshire (old type), Tamworth

× Mid York, Canadian Berkshire × Mid York, Large White × Berkshire (Canadian × old type), Tamworth × Large Black, and Canadian Berkshire × Large Black. These carcasses were exported to England and comments and criticisms of the carcass grader are offered. In general, it appeared that breed alone is insufficient for guaranteeing desirable type bacon pigs. Type within the breed is the important factor, and the selection of a strain that is capable of producing pigs in large numbers, uniform in conformation, and complying with present-day market classes is essential for success.

Hardness of pork fat as affected by alfalfa pasture and by breed, E. H. Hughes (*California Sta. Bul. 616 (1937), pp. 11, fig. 1*).—Mixed groups of Duroc-Jersey and Poland China pigs having free access to alfalfa pasture were fed either rolled barley and tankage (self-fed) or limited amounts of rolled barley and skim milk in comparison with similar groups fed the same concentrate rations in dry lots. The average feed consumption per unit of gain for each lot is indicated. By means of two measurements, i. e., physical grading of the carcasses in the cooler after 48 hr. at 36° F. and by determining the refractive index of the back fat, it was apparent that the carcasses of pigs receiving alfalfa pasture were as hard as those fed the same ration in dry lot. A breed difference in hardness of fat was observed. The average refractive index of the back and leaf fat for 115 Duroc-Jerseys was 1.4582 and for 130 Poland Chinas was 1.459. In carcass grading, 78, 20, 2, and 0 percent of the Duroc-Jersey carcasses and 26, 37, 31, and 6 percent of the Poland China carcasses graded hard, medium-hard, medium-soft, and soft, respectively.

Temperature measurements on different parts of the body of resting horses [trans. title], H. Nitsche (*Biedermanns Zentbl., Abt. B, Tierernähr., 9 (1937), No. 4–6, pp. 340–345, fig. 1; Eng. abs., p. 345*).—Temperature measurements taken at different places on the body surface of horses showed great variability. Highest temperatures were recorded on the neck, breastbone, and knee fold, and lowest temperatures on the legs. Temperature recordings of 28° and 25° C. were obtained at distances of 2 and 10 mm, respectively, from the skin surface over the midrib, while at greater distances from the body surface the temperature rapidly approached that of the surrounding atmosphere.

Metabolism trials with suckling colts, I, II [trans. title], F. Frenzel (*Biedermanns Zentbl., Abt. B, Tierernähr., 9 (1937), No. 4–6, pp. 294–339, fig. 1; Eng. abs., pp. 314, 339*).—Two phases of this study are reported.

I. *The nutrition and development of suckling colts* (pp. 294–315).—Data are presented on the yield and composition of the milk of three mares at various intervals after foaling and the live weight and body measurements of the foals at intervals to 13 weeks of age. Average milk yields were well under 10 kg daily, while the foals made average daily gains in weight of from 1.1 to 1.5 kg.

II. *Milk utilization by suckling colts* (pp. 316–339).—In a series of digestion trials it was found that during the first week of life colts digested about 90 percent of the nutrients in milk. Coefficients of digestibility showed a gradual decrease as the colts advanced in age. As they neared weaning age the digestibility of dry matter and crude fat closely approached digestibility values for mature horses. Complete data are presented for the various balance trials on sole milk diets and when milk was supplemented with dry feed. Nitrogen balances were positive with one exception in these trials. It is suggested that such short time nitrogen balance trials do not give an accurate picture of nitrogen metabolism, and that more valuable information regarding protein formation would be obtained by running nitrogen and sulfur balances simultaneously.

Physiological studies on poultry.—I, Body measurements of male and female Los Baños Cantonese fowls, F. M. Fronda and A. S. Marcelo (*Philippine Agr., 26 (1937), No. 7, pp. 561–567, figs. 2*).—Various body measurements of both male and female Los Baños Cantonese fowls taken at different ages are presented in this paper.

A manual for the identification of the breeds and varieties of domestic fowls, W. C. Thompson (*New Jersey Stas. Bul. 642 (1938), pp. 15, figs. 3*).—A key for the identification of the breeds and varieties of domestic fowls, along with general considerations involved in the selection of breeds and varieties, is set forth in the bulletin.

The general nutritive value (energy value) of foods for poultry, J. Axelsson (*Lantbr. Högsk. Ann. [Uppsala], 4 (1937), pp. 131–168, figs. 3, Swed. abs., pp. 162–165; abs. in Harper Adams Util. Poultry Jour., 23 (1937), No. 2, pp. 43–49*).—The author has compiled a vast amount of data from the varied literature relating to the digestibility of feeding stuffs by poultry, the nutritive value of the feed for poultry, and the energy requirements of fowls for maintenance, growth, and egg production. Data are presented on the average chemical composition, coefficient of digestibility, protein and net energy values, and feed unit equivalents of a wide variety of feeding stuffs, including pastures and green fodders, dry fodders, succulent winter feeds, grains and seeds, milling byproducts, oil cakes and meals, and other vegetable byproducts, and animal and fish products.

It is shown that as the fiber content of feeds increase the digestibility of the organic matter decreases much more rapidly for poultry than for ruminants, indicating the fallacy of applying feed values based upon experiments with ruminants to poultry feeding. The net energy values of feeds as determined from trials with poultry are shown to be quite constant within a range of 2–10 percent crude fiber in the total dry matter. Feeding standards covering maintenance requirements for different live weight groups, feed requirements for growth of males and females of light, medium, and heavy breeds, and requirements for egg production of different weight groups are presented.

Feeding tests on the use of dried yeast and skim milk [trans. title], Weinmiller and Mantel (*Arch. Geflügelk., 11 (1937), No. 9, pp. 293–300, fig. 1; Eng. abs., p. 300*).—In trials with four groups of White Leghorn pullets, a basal mash containing 5 percent of dried yeast was fed with supplements of 50, 100, and 150 g of skim milk and 9 g of fish meal per bird daily for lots 1, 2, 3, and 4, respectively. The highest egg production was secured from group 3, followed in order by groups 4, 2, and 1, the last ration proving quite unsatisfactory. A comparison of group 3 with a similar pen receiving the same amount of skim milk but no yeast in the mash showed 17 percent higher egg production in favor of the yeast-supplemented ration.

Minerals in poultry nutrition, H. D. Branion (*Sci. Agr., 18 (1938), No. 5, pp. 217–276*).—A comprehensive review of the literature relating to the role of minerals in poultry nutrition is presented. The bibliography includes 420 references.

The essentialness of manganese for the normal development of bone, W. D. Gallup and L. C. Norris. ([N. Y.] Cornell Expt. Sta.). (*Science, 87 (1938), No. 2245, pp. 18, 19*).—Studies in which the length of the leg bones of chicks reared on manganese-deficient and on manganese-sufficient diets was compared by means of X-ray photographs at frequent intervals and by sacrificing representative chicks at 4, 5, and 6 weeks of age showed that in practically all cases the bones of the chicks on the low-manganese diet were shorter (average from 7 to 8 percent) than the corresponding bones of their controls.

Bone analysis showed a minimum value of 0.06 mg of manganese per 100 g of dry material for chicks on the low manganese diet as contrasted with average values of about 0.2 mg in the controls. Partial depletion of manganese in the bones resulted in deformities at the joints and at the ends of the bones. Apparently manganese in small amounts is a necessary constituent of bones in the chick and is essential for normal bone development, in addition to preventing other deformities resulting from or coincident with perosis.

The effect of intraperitoneal injections of manganese, zinc, aluminum, and iron salts on the occurrence of slipped tendon in chicks, M. LYONS, W. M. INSKO, JR., and J. H. MARTIN. (Ky. Expt. Sta.). (*Poultry Sci., 17 (1938), No. 1, pp. 12–16*).—When the effect of intraperitoneally injecting solutions of manganese, iron, zinc, and aluminum at frequent intervals up to 7 or 8 weeks of age on the occurrence of slipped tendon in chicks was studied, the total milligrams of the element injected per chick ranged from 6.45 to 30.9 in the case of manganese and from 6.45 to 19.35 for the other three. The addition of manganese at these levels proved highly effective in the prevention of slipped tendon, whereas the zinc, aluminum, or iron failed to show any protective action against the occurrence of this disorder in young growing chicks. The higher levels of manganese and zinc at all levels of injection caused some retardation in growth.

The influence of age, sex, and ovarian activity on the blood lipids of the domestic fowl, F. W. LORENZ, C. ENTENMAN, and I. L. CHAIKOFF. (Univ. Calif.). (*Jour. Biol. Chem., 122 (1938), No. 3, pp. 619–633*).—The concentration of cholesterol, total fatty acids, phospholipids, total lipids, and residual fatty acids in the blood of male and female White Leghorn chickens at early ages, puberty, and maturity was determined. No significant differences were found in the levels of the various lipid fractions in the blood of males between 71 and 276 days of age, and females up to 135 days of age exhibited values similar to those observed in the males. A marked, though variable, increase in total lipids, including increases in neutral fat, phospholipids, and free cholesterol of the blood was observed in pullets at the onset of egg production. The rise occurred during puberty as well as during periods of active laying. The duration or intensity of egg production bore no relation to the level of the blood lipids during uninterrupted laying periods. The level of dietary fat had no effect on the blood lipid concentration in immature females and but slight effect in males. Substitution of fat for carbohydrates in the ration of laying pullets had no influence on the cholesterol esters or phospholipids of the blood but decreased the variability of neutral fats and free cholesterol. The contents of phospholipids, free cholesterol, and neutral fats in the blood of pullets were highly correlated, fluctuations of these constituents tending in the same direction.

Flock egg production performance, W. C. THOMPSON (*New Jersey Stas Bul. [639] (1937), pp. 20, figs. 8*).—An analysis is presented of the egg production performance of one flock each of Barred Plymouth Rock, Rhode Island Red, and White Leghorn pullets during their first laying year (November through October). The distribution of egg yields for each of the 12 mo., for the winter, spring, and summer-fall periods, and for the year, together with the mean production, standard deviation, and probable error, is indicated. In each instance, the distribution of frequencies for the yearly production closely resembled the normal curve. Suggestions are offered for the use of these data as standard of comparison.

The effect of different calcium intake levels on egg production, shell strength, and hatchability, H. O. STUART and C. P. HART. (R. I. Expt. Sta. (*Poultry Sci., 17 (1938), No. 1, pp. 3–7, fig. 1*).—A basic mash containing 2

percent calcium carbonate plus oystershell ad libitum was compared with 1-, 5-, and 8-percent levels of calcium carbonate in the mash with no supplemental source of calcium, each group receiving the same scratch mixture. One percent calcium carbonate in the mash proved insufficient to meet the needs of laying hens as evidenced by low egg production, high feed requirements per unit of production, poor hatchability, and low breaking strength of the shells. The standard ration containing 2.3 percent calcium carbonate plus oystershell proved superior to either the 5- or 8-percent levels with reference to average egg production, hatchability, feed utilization, and shell strength, and there appeared to be very little advantage of the 8-percent over the 5-percent calcium carbonate level. Birds on the standard ration consumed less calcium carbonate than those fed the 8-percent mash, indicating either poor utilization of excessive amounts of calcium carbonate or a better utilization of coarsely ground than finely ground sources of this compound.

Recent developments in studies of interior egg quality, H. L. Wilcke. (Iowa Expt. Sta.). (*U. S. Egg and Poultry Mag., 44 (1938), No. 1, pp. 16, 17, 45–50, 52, 54*).—This contribution gives a comprehensive review of the literature relating to quality of fresh eggs. A summary indicates that in general yolk color may be affected by feeding, but other factors of quality seemed to vary chiefly with the individual bird and are consequently problems of breeding. The bibliography includes 116 references.

The influence of pimiento pigments on the color of the egg yolk of fowls, W. L. Brown (*Jour. Biol. Chem., 122 (1938), No. 3, pp. 655–659*).—In further studies (E. S. R., 72, p. 93), it was found that when laying hens were fed dehydrated pimiento shells capsanthin was deposited in the egg yolk at levels of from 2 to 8.5 percent of the total carotenoid pigment in the yolk or to about the same extent as cryptoxanthin. The structural composition of the carotenoids deposited by the fowl led to the suggestion that in order for such pigments to be deposited in the egg yolk or fat it is probably necessary for at least one ring of the molecule to contain one, and only one, hydroxyl group.

Investigations on the broodiness of hens [trans. title], M. Eigemann (*Arch. Geflügelk., 11 (1937), No. 9, pp. 273–292, fig. 1; Eng. abs., pp. 290, 291*).—From an experimental group of 50 hens and also from groups entered in Bavarian laying tests, the following observations were made with reference to broodiness and sitting: Only well-fed fat hens became broody. Maximum broodiness occurred during midsummer, coincident with periods of high average temperature and with days in which the largest number of sunny hours occurred. The combs, wattles, and sexual organs were reduced in size during the sitting period. The average body temperature was approximately the same during sitting and laying periods but showed less daily variation during sitting. The excreta were watery during the first days of sitting. Tests with certain hormones showed that it was impossible to interrupt broodiness through the administration of prolan, "Tyronorman," a hormone reducing metabolism, or the corpus luteum hormone. Feeding the intestinally active part of the anterior hypophysis produced a specific diarrhea in the birds. Broodiness was induced in four hens and one capon by the administration of prolactin, a hormone of the anterior lobe of the hypophysis.

The incubation of hen eggs under increased atmospheric pressure, B. Cunningham (*Jour. Elisha Mitchell Sci. Soc., 52 (1936), No. 2, pp. 269–273*).—Employing a pressure incubator as previously described (E. S. R., 72, p. 679), eggs were incubated at 35 lb. pressure and at constant relative humidity and temperature comparable to the control lot incubated at normal atmospheric

pressure. After 9 days' incubation the average weight of the embryos developed under pressure was 2.07 g as compared with an average of 1.46 g for the controls, representing an increase of 42 percent for the pressure chicks. This early advantage of pressure incubation was not maintained to time of hatching. Eggs incubated for 18–19 days under pressure and then allowed to hatch in a normal incubator gave chicks of approximately the same weight as the controls. However, the pressure-hatched chicks showed some advantage in post-hatching rate of growth. Eggs incubated under pressure lost moisture more slowly than those at normal pressure at the same relative humidity, raising the question as to whether an increase in weight of the pressure embryos might not be due to imbibition of water.

The effect of humidity on the developmental rate of chick embryos incubated under increased atmospheric pressure, B. Cunningham (*Science, 87 (1938), No. 2248, pp. 90, 91*).—In further studies eggs were incubated at a pressure of from 25 to 30 lb. under a reduced humidity so that the moisture lost from them during incubation was practically the same as in control eggs incubated at normal pressure and humidity. Both lots were incubated at 100° F. After 11 days' incubation the average weight of the embryos developed under pressure was 6.07 g as compared with 3.69 g for the controls, giving rather conclusive evidence that pressure was the primary factor responsible for the acceleration.

Preservation and storage of hens' eggs, P. F. Sharp (*Food Res., 2 (1937), No. 6, pp. 477–498, figs. 9*).—A comprehensive review of the factors involved in the preservation of eggs and the chemical and physical evidence of quality of eggs is presented in this paper. An extensive bibliography is appended.

DAIRY FARMING—DAIRYING

Scientific reports of the Eleventh World's Dairy Congress [held at Berlin, August 22–28, 1937] (*Wissenschaftliche Berichte des XI. Milchwirtschaftlichen Weltkongresses, 1937. Berlin: Reichsmin. Ernähr. u. Landw., [1937], vols. 1, pp. XVI+506, figs. 58; 2, pp. XII+569, figs. 68; 3, pp. XII+496, figs. 71*).—The reports of the four principal sections of the Congress, namely: (1) Milk production and tropical dairying, (2) milk processing and treatment and improvement in quality, (3) legislation, sale of milk and milk products, marketing, business management, and dairy education, and (4) dairy machinery, buildings, technical factory questions, dairy implements, and means of transport, are set forth in volumes 1–3 in their original language. In addition, general reports, summaries of the subsection reports, and brief abstracts of the individual papers presented are contained in 21 separate booklets, available in German, English, and French.

Proceedings of the thirtieth annual convention [of the] International Association of Milk Dealers: Production and laboratory sections (*Internatl. Assoc. Milk Dealers, Proc., 30 (1937), Prod. Sect., pp. 85, figs. 20; Lab. Sect., pp. 192, figs. 12*).—At this meeting held in Dallas, Tex., October 21–23, 1937, the following papers were among those presented before the production section: The Status of Vitamin A as Related to Dairy Cattle, by O. C. Copeland (pp. 28–33); Buying Plans—Ratio Between Cream Fat and Whole Milk Prices, by M. J. Metzger (pp. 34–39); Uniformity of Dairy Score Card and Inspection, by W. D. Tiedeman (pp. 40–46); and Production Trends, by J. B. Shepard (pp. 47–59).

The following papers were presented before the laboratory section: The Resazurin Test for Sanitary Condition of Milk, by G. A. Ramsdell (pp. 3–19); Spoilage of Cream at Low Temperatures, by J. A. Anderson (pp. 19–24); Further

Report on Tabulations of Counts Using Proposed Changes in Medium and Temperature of Incubation of Milk Samples, by E. Kelly (pp. 25–33); The Practical Value of the Phosphatase Test in Determining the Efficiency of Pasteurization, by F. W. Gilcreas and W. S. Davis (pp. 34–56); Determining the Efficiency of Milk Pasteurization, by P. H. Tracy and A. J. Hahn (pp. 57–79); Eleventh World's Dairy Congress, by A. C. Dahlberg (pp. 79–87); How Sterilizing Agents Act on Bacteria, by I. L. Baldwin (pp. 88–96); Symposium on Newer Phases of Nutrition: Lime and Phosphorus, and Their Significance to the Milk Dealer, by W. H. Eddy (pp. 96–114) and Soft Curd and Homogenized Milks, by I. J. Wolman (pp. 114–130); Symposium on Off-Flavors: Off-Flavors in Raw and Pasteurized Milk, by G. M. Trout (pp. 131–142), Theoretical Aspects of the Causes of Oxidized Flavor Particularly From the Lecithin Angle, by L. M. Thurston (pp. 143–153), Variations in Susceptibility of Milk as Secreted by the Cow, by E. O. Anderson (pp. 153–168), Plant Processing and Control Methods in Preventing Oxidized Flavor, by W. H. Martin (pp. 169–172), Observations on the Development of Rancidity in Sweet Milk, Cream, and Butter, by J. I. Keith and E. L. Fouts (pp. 172–176), and The Causes of Off-Flavor in Milk—The Facts and a Theory, by J. A. Anderson, L. T. Wilson, and J. G. Hardenbergh (pp. 177–183); and Evaluation of Methods of Determining the Efficiency of Pasteurizing Milk, by E. H. Parfitt (pp. 183–192).

Further investigations in chopping alfalfa hay at the time of storage, J. B. Shepherd and T. E. Woodward (*Jour. Dairy Sci., 21 (1938), No. 2, pp. 89–96*).—Continuing this line of investigation (E. S. R., 76, p. 842), first-cutting alfalfa hay was field-cured without rain until it contained 15.8 percent moisture. It was then stored in an open mow to a depth of 7.5 ft., one-half the lot being stored in the natural long form and the other half coarsely chopped (¾-in. lengths). When put in storage the chopped and long hays required 227 and 592 cu. ft. of space per ton, respectively. The long hay reached a maximum temperature of 81° F. in 1 day and declined to 72° in 2 days, while the chopped hay reached a maximum of 106° in 2 days and declined to 76° in 16 days. The original hay contained 76 p. p. m. of carotene in the dry matter. After 5 months' storage (summer period) losses of 72.8 and 58 percent of the carotene occurred in chopped and long hays, respectively. Dry matter losses were moderate and about equal in the two kinds of hay.

In feeding trials with milking cows the hays proved equally palatable, and the slightly greater value of the chopped hay was of doubtful significance.

***Amide slices and glycine as protein substitutes in the feeding of milk* cows** [trans. title], J. Schmidt, J. Kliesch, A. Kämpffer, and K. Krebs (*Forschungsdienst, 4 (1937), No. 5, pp. 229–243, figs. 7*).—Three groups of six cows each producing an average of from 22 to 23 kg of milk per cow daily at the beginning of the experiment were fed rations containing oil cake, amide slices (a mixture of potatoes and urea), and crushed beets, respectively, as supplements to a basal mixture of barley and potatoes sliced over a period of 65 days. The average daily milk yield decreased 3.9, 7.5, and 9.8 kg per cow, and the average live weight changes were +3, −20, and −67 kg per cow, respectively, during the trial. The protein content of the milk was not significantly different on the three types of rations. In a similar trial in which glycine replaced oil cake in the basal ration cows decreased 7.5 kg daily in milk yield and lost 30 kg in live weight. The butterfat content of milk from cows on the glycine ration was appreciably higher than that in milk from the control lot.

Results of feeding amide slices to cows at Böblingen [trans. title], P. Carstens and A. Mehner (*Forschungsdienst, 4 (1937), No. 5, pp. 243–253, figs. 5*).—A trial extending over 105 days in which cows were fed in a similar manner

to the first trial described above gave evidence that urea can partially replace proteins in the ration of milking cows with no deleterious effect on the animal. The substitution of urea for protein concentrate resulted in a significant reduction in the protein content of the milk.

The effect of thyroid and thyroxine on milk secretion in dairy cattle, H. A. HERMAN, W. R. GRAHAM, JR., and C. W. TURNER (*Missouri Sta. Res. Bul. 275 (1938), pp. 24, figs. 5*).—The effects of subcutaneous injections of thyroxin and oral administration of desiccated thyroid on the milk and butterfat yield of cows in various stages of lactation are reported.

Feeding 2 oz. daily of desiccated thyroid to a group of cows in the declining phase of lactation over a period of 8 weeks resulted in an average increase of 18.2 percent in milk yield and 35 percent in butterfat production over the base level. Similar dosage to cows in the peak of production and to cows near the end of lactation failed to increase milk yield but caused a slight increase in fat content of the milk.

Daily injections of 5 mg of thyroxin in alkaline solution to cows in declining lactation for 3 weeks resulted in an average increase of 11 percent in milk and 22 percent in fat yield. Increasing the dosage to 10 mg daily gave a still greater increase. Similar injections to cows in peak of production resulted in an increase of pulse and respiratory rate, a rapid loss in live weight, and a marked decline in both milk and fat production. A cow practically dry also responded adversely to thyroxin injections. Increase in pulse rate and slight losses in live weight generally accompanied administration of thyroxin in either form. Fat secretion appeared to be influenced more than milk yield by the treatments. Thyroxin injected subcutaneously was more effective than an equivalent dosage administered orally as desiccated thyroid.

The effect of the method of milking on the secretion of milk and milk fat [trans. title], L. SKRODEL (*Milchw. Forsch., 19 (1937), No. 1, pp. 72–94*).—Milking the four quarters of the cow's udder simultaneously resulted in a more complete emptying of the udder than milking two quarters at a time in any combination. Milking the least well developed quarters first resulted in a higher total yield and higher fat content of the milk. The milk and fat retained in the udder through incomplete milking was not completely recovered on the following day.

The effect of the rate of milking on the secretion of milk and milk fat [trans. title], L. SKRODEL (*Milchw. Forsch., 19 (1937), No. 1, pp. 95–105*).—When only one udder quarter was milked at a time the yield of milk and fat content of the milk was reduced as compared with that obtained by the normal method of milking. When the udder halves were milked at different rates, the half milked at the slower rate yielded less milk with lower fat content, and slow milking of one-half reduced the fat content of the other half when it was milked at a normal rate. Milk retained in the udder due to slow milking was largely recovered in subsequent milkings.

Investigations on the effect of two and three milkings per day on the milk and butterfat production of cows [trans. title], I. POIJÄRVI ([*Finland*] *Valtion Maatalouskoet. Julkaisu. (Agr. Expt. Activ. State Pub.), No. 94 (1937) pp. 60; Ger. abs., pp. 49–59*).—In a series of trials it was found that cows producing from 11 to 16 kg of milk daily averaged 3.8 percent less 4-percent fat corrected milk when milked twice daily than when milked three times a day. The fat content of the milk was approximately equal in both cases. In a selected group of cows averaging over 15 kg of milk per day, two-time milkings resulted in 3.3 percent less 4-percent milk and 0.07 percent lower fat test than three time milkings.

A group of cows milked twice daily throughout one or more complete lactation periods ranged from 2,851 to 3,335 kg annual production, while the same cows on three-time milkings ranged from 3,157 to 3,332 kg. The average fat test was 0.1 percent higher under the latter plan. On the average, cows yielding from 3,000 to 3,330 kg of milk annually produced about 7 percent less milk when milked twice daily, but this reduced yield was partially offset by reduced feed and labor costs under this plan.

Reactions of the dairy cow to changes in environmental temperature, W. M. REGAN and G. A. RICHARDSON. (Calif. Expt. Sta.). (*Jour. Dairy Sci., 21 (1938), No. 2, pp. 73–79*).—Heavy milking cows of the Holstein, Jersey, and Guernsey breeds were housed for varying periods in a large psychrometric room in which the temperature was increased from 40° to 100° F. by 10° intervals, while constant air movement of 50 ft. per minute and constant relative humidity of 60 percent were maintained. As the room temperature increased there was a uniform increase in respiration rate from 12 per minute at 40° to 124 per minute at 100°, the rate approximately doubling for each increment of 18°. Pulse rate decreased with rise in temperature. At 80°–85° a pyrexial point was reached where the animals were no longer able to maintain heat balance, and at temperatures above the pyrexial point anorexia developed, milk flow declined, and the characteristics of the milk were altered. These included a lowering of the casein and solids-not-fat and an increase in butterfat content, higher pH, lower freezing point, and longer time for rennet coagulation. The butterfat was lower in volatile acids and higher in unsaturated components. Such changes probably resulted from blood changes instituted to facilitate heat disposal.

Nutritional anemia in cattle in southeastern Massachusetts, J. G. ARCHIBALD, K. J. KUCINSKI, R. O. BROOKE, and S. L. FREEMAN. (Mass. Expt. Sta.). (*Jour. Dairy Sci., 21 (1938), No. 2, pp. 59–68, figs. 2*).—A disease of cattle prevalent in certain coastal regions of Massachusetts and locally known as "neck ail" is diagnosed as a type of nutritional anemia characterized by emaciation, loss of appetite, and a diminution of the red blood cells and hemoglobin content of the blood of affected animals. The soils of these "unhealthy" areas and the native forage grown on such soils were found to be very low in iron content. Spectacular recovery followed the administration of iron compounds to the affected animals, and the feeding of roughage produced on inland soils apparently prevented the development of this ailment. The addition of iron compounds to such deficient soils gave a uniformly large increase in the iron content of grasses grown on the soils, suggesting this as an alternative method for prevention of this disease.

The warming of milk in transit, J. E. NICHOLAS. (Pa. Expt. Sta.). (*Agr. Engin., 19 (1938), No. 2, pp. 61, 62, figs. 4*).—Experiments on the rise in temperature of milk during transit at summer temperature showed that fresh milk having an initial temperature of slightly above 40° F. in a fully exposed 10-gal. can experienced an average rise of approximately 10° per hour during the first 2 hr. There was a pronounced stratification of temperature in the milk can after exposure to the warm atmospheric air, the difference in temperature between top and bottom of the same can being as great as 22.5°. The temperature of milk in jacketed and fully exposed cans (initial temperature about 43°) was 47.6° and 53.8° after 1 hr., 51° and 61.6° after 2 hr., and 64.3° and 78.1° after 6 hr. of exposure, respectively.

The New Jersey official grades for milk, J. L. YOUNG (*N. J. Dept. Agr. Circ. 284 (1937), pp. 8, figs. 5*).—The New Jersey official grades for milk and conditions governing the distribution of milk under these grades are set forth.

[**Abstracts of papers presented at the thirty-ninth general meeting of the Society of American Bacteriologists**] (*Jour. Bact., 35 (1938), No. 1, pp. 3, 51, 62, 63, 64, 65, 66, 67, 68, 69, 70*).—Abstracts of the following papers, dealing with subjects of significance in dairying, are noted: Some Factors Affecting the Germicidal Efficiency of Hypochlorite Solutions, by A. S. Rudolph and M. Levine; The Elimination of Sensitivities to Bacteriophage From Cultures of *Streptococcus lactis*, by F. E. Nelson and B. W. Hammer; A Microscopic Method for the Differentiation of Living and Dead Bacteria in Milk, by G. Knaysi and M. B. Ford; The Effect of Subminimal Temperatures Upon *Streptococcus lactis*, by O. Rahn and F. M. Bigwood; Prevalence and Classification of Hemolytic Streptococci in Pasteurized Milk, by L. W. Slanetz; Reduction in Heat-Resistance of Milk-Bacteria by Milk-Peroxidase, by K. J. Demeter; and *d*-Lactic Acid Fermentation, by C. H. Werkman and A. A. Andersen.

Standard agar counts as compared with counts on improved agars at 32° C., M. W. Yale (*Amer. Jour. Pub. Health, 28 (1938), No. 2, pp. 148–154*).—A review of the results obtained by 56 laboratories and involving about 24,000 samples of dairy products gave conclusive evidence that the use of improved media and an incubation temperature of 32° gave a greater spread between the bacterial counts of truly good quality and truly poor quality products than was obtained by the present standard method. However, the increased count by modified methods on high quality products was slight. The need for the adoption of an improved standard medium and lower incubation temperature as a means of increasing confidence in the bacterial examination of dairy products is stressed.

Thermal death-time studies of Oospora lactis, F. W. Tanner and J. W. Hofer. (Univ. Ill.). (*Food Res., 2 (1937), No. 6, pp. 505–513*).—In this study 224 cultures of *O. lactis* isolated from samples of cream were subjected to various pasteurization temperatures. None of these cultures were able to resist pasteurization at 145° F. for 30 min. Only 5.5 percent of the cultures exposed to 135° for 30 min. survived, while pasteurization at 125° did not kill any of the cultures. In testing the thermal resistance of 9 cultures in phosphate solution, one strain withstood pasteurization for 30 min. at all temperatures used up to 20 min. at 145°.

The effect of acidity on the keeping quality of unsalted butter, W. J. Wiley (*Jour. Council Sci. and Indus. Res. [Austral.], 10 (1937), No. 4, pp. 327–332*).—Studies at the Dairy Research Institute, New Zealand, gave evidence that the presence of acid in butter did not delay deterioration caused by bacterial action at storage temperatures of 40° or 65° F. At storage temperatures of 0° or 14° the greatest deterioration occurred in butters made from cream ripened to pH 5 and unneutralized. Fat in such butters showed pronounced oxidation during the storage period. Butters from cream acidified to the same extent by additions of pure lactic acid did not deteriorate so much at comparable storage temperatures nor show oxidation at comparable storage temperatures. Such butters compared favorably in score with those made from sweet cream or from creams ripened to pH 5 or 6 and then neutralized. Between pH 7.5 and 5 acidity per se had little effect on the flavor of unsalted butter.

The effect of the ripening process on the vitamin A content of Cheddar cheese, N. B. Guerrant, R. A. Dutcher, and C. D. Dahle. (Pa. Expt. Sta.). (*Jour. Dairy Sci., 21 (1938), No. 2, pp. 69–72, fig. 1*).—The vitamin A content of Cheddar cheese was determined at the time the fresh cheese was placed in the Cheddar cheese was determined at the time the fresh cheese was placed in the ripening chamber and at intervals of approximately 5, 9, and 12 mo. later by

bio-assay, using the U. S. P. technic except that assay periods were extended to 35 days. The moisture content of the four samples of cheese at the beginning of the assays was 37.36, 33.25, 30.29, and 30 percent, respectively. The data presented indicate that no serious destruction of vitamin A occurred during the ripening process. The slight measurable decrease in vitamin A potency with advanced age was almost wholly compensated for by moisture losses.

The relation of different ingredients of ice cream to its freezing and supercooling points, W. H. E. Reid (*Missouri Sta. Res. Bul. 276 (1938), pp. 8*).—Investigations were conducted to determine the effect of certain ingredients of ice cream mixes in lowering the freezing and supercooling points. Data are presented on the amounts of individual milk salts in a basic ice cream mixture and the freezing point and supercooling point of individual milk salts, sucrose, lactose, and combinations of milk salts and sugars in solution. The conclusion was reached that the extent of depression of the freezing point caused by milk salts is very slight and perhaps insignificant in comparison with the depression caused by the presence of sucrose and lactose, and that Leighton's method (E. S. R., 58, p. 573) is sufficiently accurate for all practical purposes in ice cream research.

Problems in meeting bacterial standards for ice cream, H. Macy (*Ice Cream Rev., 21 (1938), No. 6, pp. 27, 53, 54, 56; also in Ice Cream Trade Jour., 34 (1938), No. 2, pp. 8, 9, 42*).—Data are presented to indicate the importance of various ingredients in ice cream as possible sources of bacterial contamination and the inefficiency of pasteurization at 145° F. for 30 min. in reducing the bacterial count of the various ingredients. The procurement of high quality ingredients, the effective pasteurization of the mix, and the maintenance of proper sanitary conditions within the plant at all times are considered of prime importance in meeting bacterial standards for ice cream.

Effectiveness of cotton-swab methods in bacteriological examination of paper ice cream containers, M. L. Speck and L. A. Black. (Univ. Md.). (*Food Res., 2 (1937), No. 6, pp. 559–566*).—Swab methods were found more practical for the bacteriological examination of paper containers than agar-disk or rinse methods. Combining the use of one moist and one dry cotton swab simultaneously, breaking them into a 40-cc dilution blank, and thoroughly disentangling the swabs proved an effective sampling method, giving an average recovery of 83 percent of the organisms in artificially inoculated containers with a high degree of consistency.

Numbers and types of bacteria isolated from paper ice cream containers, M. L. Speck and L. A. Black. (Univ. Md.). (*Food Res., 2 (1937), No. 6, pp. 567–580*).—Employing the sampling method described above, a large number of paper containers, including open-top types of various shapes and sizes, the cylindrical type with tightly fitting crown tops, and paper serving dishes obtained from the open stock of ice cream retailing establishments and from previously unbroken packages as received from the manufacturer were examined for bacterial content. Total counts and types of bacteria encountered in the containers varied widely. Contamination from air and dust probably were the most important factors influencing these counts. In one instance containers in the original shipping package showed relatively high counts. Applying the standard for milk bottles and other dairy utensils of one organism per cubic centimeter of capacity would have disqualified many of these containers. The need for the adoption of bacterial standards for paper containers and a standard method of sampling is stressed.

VETERINARY MEDICINE

[Contributions in animal pathology and parasitology] (*Jour. Amer. Vet. Med. Assoc., 92 (1938), No. 3, pp. 251–257, 264–386, 389–469, 474–476, figs. 16*).—Contributions presented at the forty-first annual meeting of the United States Live Stock Sanitary Association, held at Chicago in December 1937 (E. S. R., 77, p. 107), are as follows: The Genetics of Cancer in Mice, by M. Slye (pp. 251–257); Accomplishments of Federal-State Bang's Disease Project, by A. E. Wight (pp. 264–269); What Does the Cattle Breeder Think About the Control of Bang's Disease? by C. L. Hill (pp. 269–278); Problems Arising in the Federal-State Bang's Disease Project, by A. J. DeFosset (pp. 279–289); Undulant Fever and Its Relation to the Public Health, by G. W. Anderson (pp. 289–298); Protective Immunization in Swine Diseases, by H. C. H. Kernkamp (pp. 310–316); Trichinosis in Swine and Its Relationship to Public Health, by B. Schwartz (pp. 317–337); Swine Erysipelas: Its Distribution, Increasing Importance, and Control, by F. Breed (pp. 344–355); A Practitioner's Problems in Swine Sanitation and Disease Control, by W. A. Aitken (pp. 355–364); Veterinary Education and Training for Public Health, by O. V. Brumley (pp. 366–380); The Province and Status of the Veterinarian in the Public Health Program, by A. F. Schalk (pp. 380–386); Differential Diagnosis of Respiratory Diseases of Poultry, by F. R. Beaudette (pp. 389–402) (N. J. Expt. Stas.); Erysipelas Outbreaks in Turkey Flocks, by H. Van Roekel, K. L. Bullis, and M. K. Clarke (pp. 403–418) (Mass.); Poultry Inspection, by C. E. Edmunds (pp. 418–423); Progress and Status of Cooperative Tuberculosis Eradication Work, by A. E. Wight (pp. 444–450); The Eradication of Tuberculosis in the Herds of New York State and the Accreditation of the State, by E. T. Faulder (pp. 450–453); and Some Observations on Morphological Forms Found in the Growth of Tubercle Bacilli and the Relationship of Such Studies to Future Research Work, by E. W. Bond (pp. 453–469).

Committee reports by their chairmen are presented as follows: On Bang's disease, C. P. Fitch (pp. 301–304); rabies, H. C. Rinehart (pp. 307–309); transmissible diseases of swine, C. N. McBryde (pp. 364, 365); transmissible diseases of Poultry, G. E. Corwin (pp. 425–429); parasitic diseases, B. Schwartz (pp. 429–433); miscellaneous transmissible diseases, A. W. Miller (pp. 433–436); legislation, C. E. Cotton (pp. 441–444); and tick eradication, T. O. Booth (pp. 474–476).

[Studies in comparative pathology, etc., in Japan] (*Jour. Japan. Soc. Vet. Sci., 16 (1937), Nos. 1, pp. 1–153, pls. 16, pp. 1–20; 2, pp. 155–303, pls. 14, figs. 10, pp. 21–36; 3, pp. 305–405, pls. 3, figs. 6, pp. 37–52; 4, pp. 407–514, fig. 1, pp. 53–80, pls. 2, figs. 2*).—The contributions presented in No. 1 (E. S. R., 77, p. 848) are: On a New Variety (*Haemaphysalis cornigera* var. *taiwana* n. var.) and a New Species (*Ixodes taiwanensis* n. sp.) of Ticks From the Formosan Domesticated Animals (pp. 1–10, Eng. abs. pp. 1–5) and On the Nymph and Larva of the Formosan Large Tick *Amblyomma testudinarium* Koch 1844 (pp. 11–16, Eng. abs. pp. 6, 7), both by M. Sugimoto; Studies on *Corynebacterium pyogenes*—II, Description of *Corynebacterium pseudopyogenes* n. sp. and Its Comparison with *C. pyogenes*, by Y. Ochi and Y. Zaizen (pp. 17–31, Eng. abs. pp. 8, 9) (E. S. R., 76, p. 244); Experimental Studies on Production of and Immunization Against Pneumonia in Rabbits, by Y. Ochi and N. Imai (pp. 32–60, Eng. abs. pp. 10, 11); On a Nematode (*Trichostrongylus axei* Cobbold 1807) From Cattle and Noroshika in Chosen (Korea), by O. Isshiki (pp. 61–89, Eng. abs. pp. 12, 13); Skin Reaction With *B[acillus] enteritidis* Gaertner in Guinea-Pigs, by S. Nagahata (pp. 90–106, Eng. abs. pp. 14–16); On the Relation Between the Quantitative Changes of Each Serum-Protein and the Increase in Efficacy of Immune Serum

Throughout the Course of Anthrax Hyperimmunization of Horses, by M. Umezu and R. Hayashi (pp. 107–135, Eng. abs. pp. 17, 18); and A Simple Cultivation Method for the Isolation of *Bac[illus] mallei*, by T. Toyoshima and Y. Shibuya (pp. 136–153, Eng. abs. pp. 19, 20).

Contributions in No. 2 are: The Effect of Atropine Injection on the Number of Red Blood Cells of the Horse and the Lethal Dose [trans. title], by T. Shijo (pp. 155–182, Ger. abs. pp. 21, 22); Studies on Blackhead—II, Mode of Infection, by D. Niimi (pp. 183–239, Eng. abs. pp. 23–26) (E. S. R., 76, p. 244); On a Nematode, *Capillaria bovis* (Schnyder 1906), From a Chosen Calf, by O. Isshiki and S. Ogata (pp. 240–249, Eng. abs. p. 27); On the Colony-Type of *Streptococcus equi*—II, The Comparison of Biological Activity, Virulence, and Variation Between 3 Colony-Types, by S. Umeno (pp. 250–270, Eng. abs. pp. 28–31) (E. S. R., 77, p. 849); Experimental Studies on the Infectious Abortion in Mares—V, Cytological Observations of the Lochia, by R. Kurosawa, E. Tatezawa, K. Hirato, and K. Kasai (pp. 271–296, Eng. abs. pp. 32–35) (E. S. R., 77, p. 849); and Antifluorescent Effect of the Growth of Hemolytic Streptococci on That of Organisms Belonging to the *Pasteurella* Group—II, The Significance of This Phenomenon for the Type Differentiation of Hemolytic Streptococci of Human Source, by S. Watanabe (pp. 297–303, Eng. abs. p. 36) (E. S. R., 73, p. 537).

Contributions in No. 3 include: On the Nematode *Tropisurus fissispinus* (Diesing 1861) and Its Transmission to Chicken in Formosa, by M. Sugimoto and S. Nishiyama (pp. 305–313, Eng. abs. pp. 37–39); Complement-Fixation Reaction in Rinderpest—IV, Infection and the Reaction, by J. Nakamura and S. Wagatuma (pp. 314–331, Eng. abs. pp. 40–42) (E. S. R., 77, p. 849); A Contribution to the Pharmacology of Caffeine and of Alcohol in Horses [trans. title], by U. Tanaka and Y. Ohkubo (pp. 332–357, Ger. abs. p. 43); Chemical and Immunological Study of Bacterial Constituents, II, by A. Toba (pp. 358–383, Eng. abs. pp. 44–48); On the Bacterial Flora Isolated From the Materials of Equine Abortion—I, The Gram-Negative Bacteria Other Than *Salmonella abortivo-equina*, by M. Soekawa (pp. 384–398, Eng. abs. pp. 49, 50); and On the Action of Hypodermatotoxin Upon the Germinal Cells of the Experimental Animal—I, On the Occurrence of Abnormal Gall Bladder Among Offsprings of Male Rabbits Treated With Hypodermatotoxin, by S. Ono (pp. 399–405, Eng. abs. pp. 51, 52).

Contributions in No. 4 include: The Etiological Relation of Contagious Pustular Stomatitis of the Horse and Horse Pox [trans. title], by N. Kii and K. Ando (pp. 407–426, Fr. abs. pp. 53, 54); Vaccination of Fowls Against Chosen Disease (Newcastle Disease) and Fowl Plague, by J. Nakamura, S. Oyama, and S. Wagatsuma (pp. 427–444, Eng. abs. pp. 55–58); Experimental Studies on the Infectious Abortion in Mares—VI, Susceptibility of Geldings to the Infection With *Salmonella abortivo-equina*, by K. Hirato, M. Soekawa, S. Miura, and R. Nakanishi (pp. 445–464, Eng. abs. pp. 59–62) (see above); Studies on Contagious Abortion in Sheep—II, Epizootiological Observations on Ovine Brucellosis Among Sheep at the Paichengtzu Sheep-Farm in Lungkiang Province, Manchoukuo, by K. Itabashi, S. Watanabe, S. Ito, Y. Tajima, and K. Otaki (pp. 465–476, Eng. abs. pp. 63–65), and III, Outbreak of *Brucella* Abortion Among Sheep at the Linsi Sheep-Farm and Its Prevention by Vaccination With Lanolin-Live-Vaccine, by S. Watanabe, Y. Tajima, S. Ito, K. Itabashi, and H. Yoda (pp. 477–493, Eng. abs. pp. 66–68) (E. S. R., 77, p. 849); An Outbreak of Contagious Abortion Among Mares and of Joint-Ill Among Foals in the Vicinity of Hailar and Chichihar, Cities at the Northern Part of Manchoukuo, by S. Watanabe (pp. 494–512, Eng. abs. pp. 69, 70); and Spontaneous Encephalitis of Rabbits, by O. Emoto, S. Kondo, and M. Watanabe (pp. 513, 514, Eng. abs. pp. 71–80).

Index-catalogue of medical and veterinary zoology.—Part 2, Authors: B to Bychkov, A. Hassall, M. Potter, M. A. Doss, M. M. Farr, and G. B. Carson (*U. S. Dept. Agr., 1938, pp. [1]+143-612*).—This second part lists the literature by authors from B to Bychkov (E. S. R., 68, p. 526).

On the serological relationship of some helminths, L. L. Eisenbrandt (*Amer. Jour. Hyg., 27 (1938), No. 1, pp. 117-141*).—In the studies reported, presented with a list of 30 references to the literature, it was found that *Macracanthorhynchus hirudinaceus* is serologically related to the parasites in the phylum Platyhelminthes but is not related to those in the phylum Nemathelminthes. *Ascaridia lineata* is not serologically related to *Heterakis papillosa* but is related to *Ascaris suis* and *Toxocara canis*.

The taxonomy of Diphyllobothrium latum (Linné 1758) in western Canada, R. A. Wardle and E. L. McColl (*Canad. Jour. Res., 15 (1937), No. 9, Sect. D, pp. 163-175, figs. 3*).—In this contribution relating to the differentiation of species of *Diphyllobothrium* Cobbold, diphyllobothriid material from humans and dogs in Manitoba, one of the three endemic areas of diphyllobothriosis in North America, is adjudged to be homogenous and specifically identical with authenticated *D. latum* material from the Union of Soviet Socialist Republics, Finland, and Japan.

Endemic typhus fever in native rodents, G. D. Brigham and R. E. Dyer (*Jour. Amer. Med. Assoc., 110 (1938), No. 3, pp. 180-183*).—Following a review presented with a list of 33 references to the literature, report is made of work which led to the finding of eight species of animals, including opossum (*Didelphis virginiana*), cotton mouse (*Peromyscus gossypinus*), old-field mouse (*P. polionotus polionotus*), golden mouse (*P. nuttalli aureolus*), wood rat (*Neotoma floridana rubida*), cotton rat (*Sigmodon hispidus hispidus*), rice rat (*Oryzomys palustris palustris*), and flying squirrel (*Glaucomys volans saturatus*), to be susceptible to typhus. The virus was also successfully passed through a young cat. Several attempts to infect raccoons failed. Recovery of the virus of endemic typhus fever from a wild mouse trapped in a rural section of Alabama is reported.

An attempt to demonstrate a labile antigen in Br. abortus, F. W. Priestley (*Vet. Rec., 50 (1938), No. 6, pp. 137-139*).—These attempts having failed, it is concluded that the difference in the immunizing ability between living and dead *Brucella abortus* organisms is not due to any difference in antigenic structure. The contribution is presented with a list of 27 references to the literature.

Field experiences in the use of biologics against bovine anthrax, T. F. Rivadelo (*Philippine Jour. Anim. Indus., 6 (1937), No. 5, pp. 461-471*).—The results obtained in the use of biologics against bovine anthrax, which exacts a heavy toll of the livestock population in the provinces in central Luzon, are considered.

Infectious bovine mastitis.—V, Bovine mastitis and milk yield, G. C. White, E. O. Anderson, R. E. Johnson, W. N. Plastridge, and F. J. Weirether (*[Connecticut] Storrs Sta. Bul. 220 (1937), pp. 35, figs. 5*).—This further study (E. S. R., 75, p. 845) concerns the milk yield of cows having one or more lactations negative and one or more positive to mastitis tests, as judged by results of the bromothymol blue test, the sediment test, the leucocyte count, and the isolation and identification of *Streptococcus agalactiae*. Complete or suspicious reactions to certain of these tests on two or more occasions, even in one quarter, during a lactation were sufficient to class that lactation as positive. Thus, in a large number of lactations the infection was incipient and subclinical in character, as the acute and clinical cases were subject to removal from the

herd. Moreover, when it became necessary to reduce numbers, the mastitis reactors usually were the first to go. Thus any significant reduction in yield becomes important from an economic standpoint, and this is especially so because the disease may extend itself to new tissues in the course of time. The records were adjusted to a uniform basis of age, length of lactation period (240 days), and times milked (three milkings in the station herd and two in a farmer's herd).

When diagnosed by the composite results of tests there was a loss in milk of 679 lb. in the station herd and 559 in the farmer-owned herd per 240 days' lactation. "In percentage the loss was 6.5 and 5.7, respectively. With one quarter reacting the loss was negligible, but the loss was successively greater with each additional quarter, reaching 1,134 and 1,111 lb., respectively, in the two herds when all four quarters reacted. Expressed in percentage, these losses amount to 12 and 11.2, respectively. Based on the bromothymol blue test, the losses ranged from 132 with one quarter to 1,206 lb. of milk with four quarters reacting. Based alone on either leucocyte or sediment content, the loss was similar to that of the bromothymol blue reactors. Based upon the presence of *S. agalactiae*, the data are too limited at present to show progressive losses with each additional quarter involved, but the evidence points strongly to heavier losses than when diagnosed by the nonspecific tests. Based upon the presence of staphylococci, the losses were less severe than when diagnosed by either of the nonspecific tests.

"About three-fourths of the reacting animals registered a loss in yield. Some individuals may pass through several lactations before the yield is drastically reduced or the milk becomes abnormal in appearance; some show a loss for one or two lactations and then recover in yield; and others suffer a drastic loss in yield and may continually produce abnormal appearing milk. There is no evidence that infection shortens the lactation period. The loss in yield occurs when the animal is limited below her natural level of production, especially during the period of normal heavy production. No influence on the percentage of fat in milk from the animals studied was evident from these data."

Individual case records of cows in the station herd (35 in number) used in the study, corrected to full age, three times milking, and 240 day lactations, are given in an appended table of 10 pages.

Concerning the use of indirect biochemical tests for the diagnosis of chronic contagious mastitis, C. K. Johns and E. G. Hastings (Wis. Expt. Sta.) (*Canad. Jour. Res., 16 (1938), No. 1, Sect. D, pp. 6–14, figs. 8*).—In work with the Dominion Department of Agriculture a series of samples taken at consecutive milkings were analyzed to determine the reliability of indirect biochemical tests (chlorides, catalase, and pH) for the detection of chronic contagious mastitis.

"It was found that infected quarters not infrequently yield normal milk while many noninfected quarters yield milk giving definitely abnormal reactions. Furthermore, the reactions to these tests frequently fluctuate widely from milking to milking for both infected and noninfected quarters. These findings suggest the need of caution in the use of these tests as the basis for diagnosing mastitis infection, especially since the proportion of apparently normal animals showing abnormalities in the secretion is probably much larger in many herds than is generally appreciated.

"These studies emphasize the value of examining a series of samples at consecutive milkings in order to obtain a true picture of the condition of a quarter. They also suggest that of the three tests studied the catalase test appears to be the most sensitive indicator of infection."

Bovine mastitis: Notes on incidence, aetiology, and diagnosis, *R. Gwatkin, S. Hadwen, and H. M. LeGard* (*Canad. Jour. Compar. Med., 1 (1937), No. 3, pp. 7–16*).—In the course of the studies here reported 594 cows in 28 herds were examined physically and the milk of individual quarters submitted to the bromothymol blue and rennet tests and microscopic and bacteriological examination. "Two hundred and thirty-two, or 39 percent, of these animals had mastitis; 57, or 9.6 percent, were suspicious; and 305, or 51.4 percent, were free from evidence of infection. There were 156 cases of streptococcus infection (67.2 percent of cases of mastitis), 50 staphylococcus (21.5 percent), 3 *B[acillus] pyogenes*, and 23 in which the cause was not determined. If 67 percent of cases of undetermined etiology were added to the streptococcus cases, that figure would be about 73.7 percent of the total cases. The percentage of infected animals ranged from 15 to 91 in the 28 herds.

"In addition to these, 54 samples were sent in from 30 other herds. Thirty-two of these were due to streptococci, 6 to staphylococci, 10 to members of the colon-aerogenes group, 2 to *B. pyogenes*, while in 4 the cause was not determined.

"Grouping the two lots, there were 286 cases of mastitis, 185 of which were due to streptococci (64.7 percent); or if 67 percent of the undetermined cases be considered as streptococcic this percentage would be about 71, and of the streptococci examined 86.5 percent were *Streptococcus mastitidis*. There were 56 staphylococcus infections (19.6 percent), but as 20 of these cases occurred in 2 herds the 13.6 percent encountered in the remaining 26 herds is probably a truer figure for this infection. There were 10 colon (3.5 percent) and 5 *B. pyogenes* infections (1.7 percent).

"Cultures failed to demonstrate the causal organism in 9.1 percent of the cases of mastitis. Bromothymol blue and rennet coagulation tests together were negative in 25.5 percent of these cases. Clinical examination failed to pick 20.7 percent of cases determined by the combined methods. Microscopic examination, in 200 cases in which *S. mastitidis* was isolated, showed 15 cases where there were few cells and no cocci (7.5 percent) and 35 in which there was an abnormal cell picture but no cocci were observed (17.5 percent). These figures are based on one examination only. If subsequent examinations were included the percentage of error would be less, as shown by results in those herds that have been regularly retested. Eleven cows with indurated mammary glands appeared normal by all other tests.

"The percentage of infection in primipara was 10.4, compared to 37.5 in the older animals. Of 265 cases 31.7 percent were infected in all quarters. Considering single quarters only, there were 49 hindquarter infections compared to 30 front quarters. Ten cases of infection due to organisms of the colon-aerogenes group were encountered (3.5 percent). All were acute and 6 terminated fatally. Five cases of *B. pyogenes* infection were diagnosed (1.7 percent). Four were chronic, and 1 was acute with a fatal termination."

Note on the use of sulfanilamide in the treatment of chronic bovine mastitis due to streptococci, H. W. Johnson and W. T. Miller (*Jour. Amer Vet. Med. Assoc., 92 (1938), No. 4, pp. 548–555*).—In two experiments in which sulfanilamide was employed in the treatment of chronic streptococcic mastitis in dairy cattle no curative effect was observed. In the first experiment 75-grain doses of the powdered drug were given twice daily for 3 days on the feed, and in the second 0.5 oz. in powder form was sprinkled on the feed of four cows twice a day for a period of 8 days.

Coccidioidal granuloma in calves, C. L. Davis, G. W. Stiles, and A. N. McGregor (*Jour. Amer. Vet. Med. Assoc., 92 (1938), No. 4, pp. 562, 563*).—This

note, which reports the *demonstration of lesions of coccidioidal granuloma in* cattle under 1 yr. of age, showing that the disease may affect the young bovine *and that pulmonary lesions may occur in the early stages of the disease*, supplements the contribution previously noted (E. S. R., 77, p. 852).

[Contributions on nasal schistosomiasis] (*Indian Vet. Jour., 14 (1938), No. 3, pp. 219–251, pls. 15, figs. 5; pp. 252–261, fig. 1; pp. 261–278*).—Three contributions on nasal schistosomiasis are presented, viz, (1) A Comparative Study of *Schistosoma spindalis* Montgomery 1906 and *Schistosoma nasalis* n. sp. and (2) Further Observations on Bovine Nasal Schistosomiasis, both by M. A. Narayan Rao (E. S. R., 74, p. 853), and Observations on the Treatment of Bovine Nasal Schistosomiasis, by M. A. Narayan Rao and S. V. Mudaliar.

Comparative resistance of cattle and carabaos to rinderpest and its relation to immunization, M. M. ROBLES (*Philippine Jour. Anim. Indus., 6 (1937), No. 5, pp. 457–459*).—In the experiments reported native cattle and carabaos were found to be equally susceptible to artificial rinderpest infection, but their resistance varied greatly.

Urinary calculi with special reference to cattle and sheep, I. E. NEWSOM. (Colo. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc., 92 (1938), No. 4, pp. 495–502*).—Outbreaks which have resulted in losses in sheep and cattle from phosphatic calculi and investigations of their cause and composition, symptoms resulting, lesions, treatment, and prevention are here considered. While the causative factors of importance remain to be definitely determined, experience indicates that they are more prevalent during the winter and when the animals are on a dry roughage, deficient in vitamin A and high in phosphate. "The addition of lime may also be a factor. Whether beet byproducts are responsible is still controversial. Where sheep are eating large quantities of wet pulp they drink no water, but calculi are quite rare. The case against tops and molasses seems to be stronger. Bran, wheat, and cottonseed cake are, to say the least, under considerable suspicion. Finally, a change of either cattle or sheep to corn and alfalfa has usually resulted in a cessation of the outbreaks."

The contribution is presented with a list of 16 references to the literature.

Difficult swallowing in a horse, L. P. DOYLE and J. F. BULLARD. (Ind. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc., 92 (1938), No. 4, pp. 564–566, figs. 2*).—The findings in this case suggest that a rather extensive and careful search of the nervous mechanism may be necessary in order to find a satisfactory pathologic explanation for paralytic symptoms in cases of difficult swallowing in the horse.

Anoplocephaliasis in Minnesota horses, O. W. OLSEN. (Minn. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc., 92 (1938), No. 4, pp. 557–559*).—Notes on the occurrence of the large tapeworm *Anoplocephala magna* and the small tapeworm *Paranoplocephala mamilliana* in horses are presented.

The ultracentrifugal concentration of the immunizing principle from tissues diseased with equine encephalomyelitis, J. W. BEARD, H. FINKELSTEIN, W. C. SEALY, and R. W. G. WYCKOFF (*Science, 87 (1938), No. 2248, pp. 89, 90*).—In these studies, of which a brief report is made, the ultracentrifuge was used to concentrate and purify the immunizing principle from formalin-inactivated diseased tissues. Formolized tissue suspensions were completely inactive, as judged by their ability to initiate disease in either mice or guinea pigs; when injected in sufficient amounts, they were capable of immunizing guinea pigs.

For experiments in concentration, such suspensions were cleared of gross material by low-speed centrifugation and then run 1½ hr. in a quantity ultracentrifuge using a field of ca. 60,000 g. Samples of the supernatant liquids,

which were of high protein content, were reserved for tests of immunizing power; the rest was discarded. The large pellets found after ultracentrifugation were resuspended, and their solutions further purified by repetition of the cycle of low-speed centrifugation and ultracentrifugation. In no instance was there to be seen any trace of the more rapidly sedimenting material that may be the infectious substance.

The immunizing capacities of the supernatant fluids and of the final solutions have been tested by subcutaneous injection into 400-g guinea pigs of two equal doses at an interval of 1 week, and by intracerebral injection of from 100 to 500 m. l. d. of active virus 2 weeks after the second immunizing injection. Complete immunity has been conferred by small amounts of the final product, whereas the supernatant fluids have been devoid of immunizing capacity.

Canine distemper in the rhesus monkey (*Macaca mulatta*), G. Dalldorf, M. Douglass, and H. E. Robinson (*Jour. Expt. Med., 67 (1938), No. 2, pp. 323–332, pl. 1, fig. 1*).—In the experiments reported canine distemper was transmitted to rhesus monkeys by a variety of methods. The disease is strikingly similar to, if not identical in its features with, distemper in dogs.

Infection of the chicken with Capillaria columbae (Rud.), P. P. Levine (*Jour. Parasitol., 24 (1938), No. 1, pp. 45–52*).—In a study of the nematode parasite of chickens, *C. columbae*, its direct life cycle was confirmed. "Complete embryonation of the ova takes place in shallow layers of distilled water at 30° C. within 6 to 7 days. Twenty-four hr. after the ingestion of the ova by chickens the larvae can be found penetrating the intestinal muscosa. The worms mature in 21 days, at which time fertile nonembryonated ova are found in the feces of the parasitized birds.

"A severe infection with *C. columbae* was experimentally produced in chickens. The clinical symptoms and weight records of the parasitized birds showed that this parasite was pathogenic for fowls, and heavy infections caused loss of weight, emaciation, and death. The lesions consisted of a catarrhal enteritis with desquamation of the intestinal epithelium.

"The comparative ease with which parasitized pigeons may transmit *C. columbae* to chickens suggests the necessity for the elimination of pigeons in any control program.

"The attempt to prevent infection by feeding mash in which was mixed 2 percent tobacco dust by weight was unsuccessful. Individual treatment of birds with single doses of carbon tetrachloride and tetrachloroethylene likewise was not successful."

Colibacillosis in young chicks, C. R. Davis (*Jour. Amer. Vet. Med. Assoc., 92 (1938), No. 4, pp. 518–522*).—In an investigation of losses conducted in Maryland pure cultures of *Bacillus coli communis* were obtained on autopsy of chicks originating from the same hatchery but coming from four widely scattered flocks. It was found that the use of a faulty incubator having insufficient moisture and improper ventilation resulted in a poor hatch of chicks with low vitality; and that *B. coli communis* may become pathogenic for chicks with low vitality. It is concluded that cultures must be made and identified in order to avoid confusion of this infection with that of pullorum disease.

A study of the bacteria occurring in commercial fowl-pox vaccine, H. A. Dettwiller and F. S. Markham (*Poultry Sci., 17 (1938), No. 1, pp. 46–48*).—During the course of the study in the United States here reported 20 samples of fowl pox vaccine representing the stock of 7 widely separated manufacturers were examined bacteriologically, the total counts and relative percentage of the different species of bacteria present having been determined.

"Neither *Salmonella pullorum, Pasteurella avicida*, nor any other recognized poultry pathogen was found. It is concluded that the bacteria found in commercial fowl pox vaccines are of the 'opportunist' type, and that postvaccination mortality in flocks cannot justifiably be attributed to pathogenic bacteria present in such products."

The effect of iritis of breeding hens on their progeny, D. E. MADSEN. (Utah Expt. Sta.). *(Poultry Sci., 16 (1937), No. 6, pp. 393–397)*.—Studies of the occurrence of an indistinct or dull-eyed condition in the station flock of White Leghorns indicated that the infective agent produces pathological changes in at least a part of the hematopoietic organs to the exclusion of direct nerve tissue involvement. The results through two generations do not suggest the transmission of the disease through the egg from dam to daughter. Evidently, iritis-infected hens are not necessarily progenerators of lymphomatosis, and there was some evidence that the progeny of such birds showed a lower incidence of the disease than was exhibited in the rest of the flock.

Susceptibility and resistance of some strains of chickens to fowl leucosis, *H. L. WILCKE, C. D. LEE, and C. MURRAY*. (Iowa Expt. Sta.). *(Poultry Sci., 17 (1938), No. 1, pp. 58–66, figs. 2)*.—This work, the details of which are presented in tables and graphs, has led to the conclusion that it is possible through selection to develop strains of birds resistant or susceptible to fowl leucosis. The causative agent of fowl leucosis was shown to be extremely virulent, the progeny of seven out of the eight matings used being equally susceptible to the disease whether injected with the virus or simply exposed to the disease by contact. The progeny of individual hens were found to be quite variable in their resistance or susceptibility to the disease.

Experiments in the transmission of fowl lymphomatosis by inoculation, J. R. BEACH *(Poultry Sci., 17 (1938), No. 1, pp. 67–71, fig. 1)*.—Data are presented with a tabulated summary for the purpose of placing on record failure to demonstrate the transmissibility of avian lymphomatosis in two concurrent series of transmission trials with two strains of the disease. It is pointed out that the data are not intended to dispute those who feel that convincing evidence of the transmissibility and infectiveness of the disease has been produced, nor those who hold to the opinion that there is a genetic basis for its occurrence.

Meal beetles as intermediate hosts of poultry tapeworms, M. W. HORSFALL *(Poultry Sci., 17 (1938), No. 1, pp. 8–11)*.—In the experiments reported the widely distributed red flour beetle and the confused flour beetle were experimentally infected with three species of common poultry cestodes, namely, *Hymenolepis carioca, Choanotaenia infundibulum*, and *Raillietina cesticillus*. The resulting cysticercoids were fed to laboratory-raised chickens and the adult cestodes recovered upon post-mortem examination. These two species of beetles, which usually feed upon cereal products, were found to eat gravid segments of *R. cesticillus* even when abundant meal was available.

The occurrence of blackhead in turkeys in the Philippines, Z. DE JESUS *(Philippine Jour. Anim. Indus., 6 (1937), No. 5, pp. 529–535, pls. 2)*.—The occurrence of blackhead in turkeys in the Philippines is reported for the first time, with a list of 24 references to the literature.

Haemoproteus sp. from the common black duck (Anas rubripes tristis), C. M. HERMAN *(Jour. Parasitol., 24 (1938), No. 1, pp. 53–56, fig. 1)*.—The finding of low-grade infections of a species of *Haemoproteus* in 6 of 85 common black ducks *(A. rubripes tristis)* examined on Cape Cod, Mass., during the summer of 1936 is reported upon. A table is given with the distinguishing characteristics of the gametocytes of the hemoproteids reported from ducks, namely, *Nettion*

castaneum, *Sarcidiornis melanota*, *Cairina moschata*, and *A. rubripes tristis*. This is thought to be the first record of the genus from a North American duck.

AGRICULTURAL ENGINEERING

Irrigation by sprinkling, J. E. Christiansen. (Calif. Expt. Sta.). (*Agr. Engin., 18 (1937), No. 12, pp. 533–538, figs. 14*).—This contribution reports the results of 170 sprinkler distribution tests.

For a pressure of 20 lb. per square inch most of the water was distributed in a ring near the outside edge of the area wetted. Uneven distribution is frequently due to a variation in the rate of rotation; all sprinklers tested showed some variation, some much more than others. The tests show that uneven rotation is not due to wind, as is commonly believed. Speed of rotation greatly affects the distribution. To obtain maximum coverage a sprinkler should rotate not faster than 1 r. p. m. Often they rotate as slowly as ⅕ r. p. m.

A detailed analysis of all the sprinkler tests, together with a number of geometrical patterns, showed that the most uniform distribution resulted from a conically shaped pattern where the application was a maximum at the sprinkler and tapered off uniformly to the edges of the area wetted. Sprinklers with this type of pattern should be spaced fairly close together along the line and not more than 60 percent of the diameter covered in the other direction. A spacing along the line of about half the spacing between lines, or distance the line is moved, is quite satisfactory. The customary spacing of 40 ft. between sprinklers will give good results when the sprinklers are performing properly, but is too far for low pressures and for sprinklers that rotate rapidly.

Evaporation loss from the spray was very little, the principal loss by evaporation being from the wet surfaces of soil and plants during and following the application of water. This loss frequently amounts to a large part of the total applied, especially with frequent light applications.

A series of field tests to determine the friction factors or coefficients for the special pipe and couplings used for sprinkler systems indicated that the pressure losses were proportional to the square of the flow or velocity in the pipe. This was found to be due to the partial recovery of velocity head at each sprinkler where the mean velocity in the pipe is reduced. For this reason the Weisbach formula $H_f=\frac{f\,L\,V^2}{2gD}$, was adopted, and the average value of f was found to be about 0.018, there being no appreciable difference between different makes of pipe tested.

For convenience, the Weisbach formula can be written $P_f=\frac{0.0134 f\,L\,Q^2}{d^5}$ where P_f is the friction loss in pounds per square inch, L is the length of the line in feet, Q is the flow in gallons per minute, and d is the inside diameter of the pipe in inches.

In planning small systems it is good practice to proportion the pipe sizes and nozzle sizes so that the overall pressure ratio does not exceed 1.2. On large systems it is not always advisable to limit the ratio to this amount, since pipe larger than 4-in. outside diameter is heavy and difficult to carry. Many systems in use have pressure ratios in excess of 2.0. For some tested, the ratio was approximately 3.0. Such systems are very inefficient, and the pressure at the end of the line is generally altogether too low for satisfactory sprinkler performance.

Field tests made on 22 systems operating with double lines, together with information obtained from the owners regarding fuel and labor costs, indicated that the average operating cost was 51 ct. per acre-inch for labor and 20 ct. for power (fuel, lubricating oil, and miscellaneous items), or a total of 71 ct. per acre-inch,

exclusive of depreciation and maintenance. The 17 systems with single lines averaged 72 ct. for labor and 26 ct. for power, or 98 ct. per acre-inch. Two large systems using 5-in. pumps and diesel tractors for power showed costs of 36 and 39 ct. for labor and 7 and 8 ct. for power, respectively, or total operating costs of 43 and 47 ct. per acre-inch. The average acreage covered per day was 12.5 for the systems with double lines and 8.3 for the systems with single lines. The average daily output was 31.7 acre-in. for the double-line systems and 16.0 acre-in. for the single-line systems, making the average applications 2.5 and 1.9 in., respectively. Since two men were employed on most systems the difference in output accounts largely for the difference in costs.

The studies indicate that portable sprinkler systems have generally proved satisfactory in areas with a high water table and in some places near the coast where the seasonal water requirement is low. They are satisfactory for irrigating spring crops, such as peas, that require only one or two light applications in addition to the normal winter rainfall. They are especially well adapted to land of irregular topography that is difficult to irrigate by surface methods, and for shallow or coarse-textured soils of low water-yielding capacity that require light applications at frequent intervals. Sprinkling is a method that is generally satisfactory for special conditions where surface irrigation is not feasible or practical. It is limited principally by the cost, which, for most conditions, is higher than for surface methods of irrigation.

Irrigation development in Montana.—Part 1, Water supply, O. W. Monson, C. McKee, and P. L. Slagsvold (*Montana Sta. Bul. 353 (1938), pp. 55+[1], figs. 11*).—In this bulletin an attempt is made to give a picture of Montana's water supply from rivers and small streams. A brief description is given of the present and potential uses of this water supply, together with a discussion of some of the problems involved in its development and use, primarily from the standpoint of irrigation.

Surface water supply of the United States, 1936, parts 4, 6, 13 (*U. S. Geol. Survey, Water-Supply Papers 804 (1937), pp. 160, pl. 1; 806 (1938), pp. 370, pl. 1; 813 (1937), pp. 242, pl. 1*).—These papers present the results of measurements of flow made on streams during the year ended September 30, 1936, No. 804 covering the St. Lawrence River Basin, No. 806 the Missouri River Basin, and No. 813 the Snake River Basin.

The floods of March 1936.—Part 3, Potomac, James, and upper Ohio Rivers (*U. S. Geol. Survey, Water-Supply Paper 800 (1937), pp. IX+351, pls. 16, figs. 57*).—This volume presents some of the important facts of the 1936 floods with respect to these basins, supplementing previously noted papers (E. S. R., 78, pp. 404, 859).

The dynamic properties of soil.—VII, A study of the nature of physical forces governing the adhesion between soil and metal surfaces, F. A. Kummer and M. L. Nichols. (Ala. Expt. Sta.). (*Agr. Engin., 19 (1938), No. 2, pp. 73–78, figs. 6*).—In a seventh contribution (E. S. R., 71, p. 707) progress results of studies of the principles underlying the adhesion between soil solutions and metal surfaces are reported. A considerable number of metal samples, including a great variety of standard plow steels, special alloy steels, and irons, was used.

Differences in grain structure of metals with the possible difference in potential between the various grains materially affected the spreading angle and the subsequent adhesion between the soil solutions and metal surfaces. The presence of alloying materials in steels and even in cast iron was accompanied in some cases by a considerable decrease in surface wetting. The decreased adhesion force in the alloy steels was probably due to the fact that the corro-

sion-resisting properties inherent to some alloy steels affected the surface reactions taking place during the period of contact of the soil solution with the metal. Alloys which tend to produce homogeneous structures in the austenitic state are electrically less active and thus decrease the galvanic action on the surface, which logically reduces the surface reactions. Since all corrosion prevention is accomplished through the action of protective films, the passivity associated with alloy steels is thought due to the presence of an oxide type of film kept constantly in repair by the action of the atmosphere. The films on stainless steel are thought to be very thin (one to two molecular layers). The thinner films give the best protection, as the presence of a thin film indicates that the protective film stifles its own growth. Thus the decreased wetting exhibited by the alloy metal samples may be due to a decrease in the thickness of the protective film.

Metals which had free graphitic carbon, such as cast iron, had a great attraction for the soil solutions. This was thought to be due to the absorption of hydrogen by the graphite, thus preventing the polarization of the active surface, or possibly in part to the presence of impurities. The test results also indicate that grain size and other structural differences due to heat treatments affect adhesion or the wettability of the metal surface, which seems to decrease with increasing hardness of the metal.

While the results given exhibit definite trends in the behavior between metal surfaces and soil solutions, they are considered to be as yet inadequate for direct recommendations.

Experimental studies in terracing, D. D. Smith. (U. S. D. A.). (*Agr. Engin., 19 (1938), No. 2, pp. 63–66, figs. 5*).—Run-off and soil loss data from certain of the terracing experiments at the Bethany, Mo., Soil Conservation Experiment Station are presented and discussed. These data show that the major soil loss in run-off from terraced land occurs when the area is without vegetative protection. Of a 5-yr. average soil loss in run-off of 1.42 tons per acre, 58.7 percent was during the corn year, 36.8 during the oats year, and 4.5 during the clover-with-timothy year (3-yr. rotation). Of a 5-yr. average run-off of 5.2 in. from an average annual rainfall of 30.5 in., 50.2 percent was during the corn year, 35.9 during the oats year, and 13.9 during the clover-with-timothy year. Soil loss in run-off and run-off are nearly always high for corn, low for clover with timothy, and high or low for oats, depending upon the season. Two rains in a 5-yr. period accounted for nearly half of the total soil loss in run-off. Vertical intervals of 5 and 8 ft. are desirable for 7- and 13-percent slopes, respectively, on normal Shelby loam. Terrace grades above 4- to 6-in. fall per 100 ft. are undesirable from an erosion standpoint, and grades below 2-in. fall per 100 ft. are undesirable due to ponds in the channels. Variable grade of 2- to 4-in. fall per 100 ft. is desirable for the general condition of the Shelby loam region. Soil loss in run-off was 56 percent and run-off 80 percent for contoured corn in comparison with checkrowed corn on terraces. Five-yr. average annual maintenance on 8.3 miles of terraces has been 5.9 man-hr. and 2.8 tractor- and grader-hr. per mile. Plowing terraces uphill with a two-way plow increased their height 57 percent. Disking, harrowing, and planting to corn reduced the terrace height 23 percent from height after plowing. Terraces materially reduced the peak rate of run-off during erosive storms on small cultivated watersheds. Terraces increase the surface detention during excessive run-off periods.

Bibliography on highway safety, compiled by M. A. Wilson (*U. S. Dept. Agr., Misc. Pub. 296 (1938), pp. [1]+136*).—This bibliography is selective in character and includes references to books, articles printed in technical and

other periodicals, and publications of societies. It covers the period from 1928 through May 1937.

Nebraska tractor tests, 1920–1937 (*Nebraska Sta. Bul. 313 (1938), pp. 43*).—This bulletin summarizes the results of 93 tests of tractors conducted during the 18 yr. of tractor testing at the station and includes data on all tractors reported by their manufacturers as on the market January 1, 1938 (E. S. R., 76, p. 860).

Effect of tire size on tractor efficiency, R. H. WILEMAN. (Ind. Expt. Sta.). (*Agr. Engin., 19 (1938), No. 1, pp. 27, 28*).—These investigations afford comparisons of the efficiency of two- and three-plow tractors under varying plowing conditions when equipped with steel wheels and two sizes of rubber tires. The greater efficiency shown by the rubber tires over steel wheels can be largely accounted for by the reduction in rolling resistance of the tractor itself when equipped with rubber tires.

In similar tests made with an 8-ft. tandem disk and a 10-ft. spiketooth harrow, data for both the first and second times over the field after plowing show the difference in rolling resistance between steel wheels and rubber tires to be less when working on plowed ground than when plowing. There was but little difference in the rolling resistance between the steel wheels and rubber tires in the case of the lighter tractors when working on plowed ground. The actual drawbar horsepower developed was practically the same for the steel as for the rubber, although the speed was increased in most cases when the rubber tires were used. In trying to determine a reason for this it was found that although the height of the drawbar was kept the same, the depth to which the disk penetrated decreased as the speed increased. The result of an increase in speed without changing the angle of the disk was that better pulverization of the soil resulted, although it did not extend quite as deep as when the speed was reduced. The differences in the amount of fuel used show a direct relationship to the speeds of operation of the tractor.

A greater difference between the rolling resistance of the steel wheels and rubber tires was found with the three-plow than with the two-plow tractors on plowed ground. The difference in weight of the two sizes of tractors which caused the heavier tractor to penetrate deeper into the loose soil is probably the best explanation for this variation. This was very apparent in the plowed alfalfa sod where the soil pulverized more and was much looser than was the case with the timothy sod.

It is apparent from these data that in order to secure the best operating efficiency it is important to select a size of rubber tire which has the proper over-all diameter to fully utilize the advantages of the reduced rolling resistance of the tractor.

A simple low-cost drawbar dynamometer, A. T. HENDRIX. (Univ. Tenn.). (*Agr. Engin., 18 (1937), No. 12, pp. 544, 546, figs. 3*).—A simple drawbar dynamometer which has been developed is briefly described.

Some dynamometer tests of tracks and rubber, W. A. HARPER (*Agr. Engin., 19 (1938), No. 1, pp. 23–25, figs. 5*).—This paper presents the results of investigations on certain phases of measured performances of tractors and wagons equipped with tracks and low-pressure pneumatic tires and towed over various surfaces behind the drawbar dynamometer. On hard-packed, smooth soil and slag surfaces all of the wagons had approximately the same draft, from 50 to 70 lb. per ton. Under conditions of greater draft, caused by an increase of soil moisture or cultivation, or both, the draft of rubber increased more rapidly than did the draft of tracks. When pulling a loaded wheel over a surface the least draft is obtained when the axle travels in a horizontal plane and when there

is no movement or deflection of the tire or of the soil surface. For a given wagon and load, the amount of soil deflection or displacement is a function of the unit pressure exerted by the wheel, and the amount of tire deflection is a function of tire design and inflation. There is no appreciable deflection of the track-type wheel. Over a series of conditions from wet to dry the type of wagon that shows the greatest range in draft is the one which has the highest unit pressure on the soil surface. This theory was checked in another way by pulling the wagons over the same track a number of times. The soil displacement under the wheels may be too slight for observation, but by multiplying the effect deep ruts are made where on the first time over only the dynamometer was sensitive enough to detect the difference in draft. The data show the draft for dry loam cultivated 6 in. deep to be 110 lb. per ton for tracks and 160 lb. for rubber.

Distillate as a tractor fuel, E. L. Barger and J. L. Gale. (Kans. Engin. Expt. Sta.). (*Agr. Engin., 19 (1938), No. 2, pp. 67–71, figs. 9*).—Studies are reported, the purpose of which was to determine the essential characteristics of a satisfactory distillate for use as a tractor fuel. Performance tests were run on nine test distillates in two engines.

It was found that a fairly close correlation exists between the thermal efficiency and the octane rating of a distillate at the heavier loads, at which point detonation becomes a limiting factor as regards thermal efficiency. The higher octane fuels detonate less at the heavier loads and therefore maintain a relatively higher efficiency compared with the low octane distillates. At low loads, however, there is an apparent tendency for the lower octane fuels to show a higher thermal efficiency than the higher octane fuels. The explanation for this may be that the very properties which promote detonation at heavy loads cause relatively complete combustion and higher temperatures at the lighter loads. On this theory the low octane fuels would tend to give better performance at the lighter loads; however, it is performance with heavy loads which is of major importance in tractor operation.

The results indicate no significant correlation between the thermal efficiency of a distillate fuel and its distillation range, although there seems to be some tendency for the fuels of lower boiling range to produce a higher thermal efficiency. The findings in respect to the correlation of the thermal efficiency and the octane rating of a distillate are equally valid regarding the relationship between specific fuel consumption and octane rating. The reason for this exceedingly close connection between thermal efficiency and specific fuel consumption lies in the fact that the range in higher heating values is practically negligible. For the nine test fuels the higher heating values varied between 19,200 and 19,685 B. t. u. per pound, or only 2.5 percent.

The relationship between brake horsepower at maximum safe sustained load (medium detonation) and the octane rating of a distillate fuel is quite definte. Carburetor settings for the nine distillates were quite uniform on a given engine. Spark settings for maximum load were somewhat more variable. The higher octane fuels permitted the greater spark advance. The use of water as an antidetonant and its effect on detonation, maximum safe sustained load, and thermal efficiency was investigated. For low octane fuels of high distillation range, the maximum safe sustained load could not be increased because sufficient water to limit detonation could not be injected without dropping the load. However, for a low octane fuel with a low distillation range, the maximum safe load was increased 42.5 percent and as much as 28 percent without appreciable sacrifice of thermal efficiency.

Medium octane fuels (from 23 to 30) responded fairly well to water injection, showing a useful power increase of 24.6 and 10 percent, respectively. High

octane fuels (from 34.5 to 43) exhibited negligible power increases and then only at great loss in thermal efficiency. The thermal efficiency curve for a fuel when using water crosses the efficiency curve for the fuel without water injection at, or very close to, the point of maximum safe sustained load (or medium detonation). In general, the use of water increases the thermal efficiency of a distillate only when operating at such a load that detonation (without water injection) would have had an intensity greater than medium. Conversely, thermal efficiency is higher without water injection for loads which do not cause more than medium detonation. No more water should be injected than that required to reduce the detonation to medium intensity.

These and other findings prompted the authors to recommend the following minimum specifications for a generally satisfactory distillate fuel for use in the conventional low compression tractor: Gravity not below 38° A. P. I., initial point not above 360° F., 10 percent point not above 390°, 30 not above 420°, 50 not above 435°, 70 not above 450°, 90 not above 480°, 95 not above 515°, and end point not above 540°, octane rating not less than 30, and sulfur content not over 0.2 percent.

Systems for distributing fuel oil to orchard heaters, F. A. Brooks. (Calif. Expt. Sta.). (*Agr. Engin., 18 (1937), No. 12, pp. 541–543, figs. 6*).—Lay-out and equipment plans for refueling orchard heaters are presented and discussed.

Tests of tillage tools.—II, Effects of several factors on the reactions of fourteen-inch moldboard plows, J. W. Randolph and I. F. Reed. (U. S. D. A.). (*Agr. Engin., 19 (1938), No. 1, pp. 29–33, figs. 7*).—In a second contribution (E. S. R., 77, p. 408), studies are reported on the effects of soil condition, speed, depth and width of cut, and landside on the directional, vertical, and side components of force acting on 14-in. plow bottoms working in Norfolk sand and Davidson loam soils and to a certain degree in Decatur clay soil.

It was found that changes in either the compactness of the soil as measured by apparent specific gravity or the percentage of moisture affect the force reactions of the Davidson loam soil markedly. This soil reaches a lubrication phase at slightly above 11 percent moisture content. These data are taken to indicate that soil conditions affect the force reactions for plowing and that, until comprehensive correction curves to compensate for variation in moisture, apparent specific gravity, and other factors in the physical condition of the soil are available, it will be necessary to compare the effects of plow design and operation factors only for similar soil conditions.

It was noted that the draft, per square inch of furrow slice turned, increased with speed, but due to the limited speed range it was not possible to tell whether or not it was a straight line ratio. The data for two 14-in. general-purpose bottoms in Norfolk and Davidson loam and one stubble-type bottom in Decatur clay show that the increase in draft with speed is not a straight-line relationship. Parabolic curves of best fit have been fitted to the data for the Norfolk and Davidson soils by the method of least squares. The actual test data deviate but slightly from the calculated curves.

Results of tests in Norfolk sand and Davidson loam indicate that 14-in. general-purpose bottoms are designed to operate most effectually when cutting approximately 6 in. deep. Preliminary studies on other sizes of bottoms indicate that their most efficient plowing depth is from 5 to 7 in. also, rather than one-half the width of cut.

With reference to effect of width of cut the results show a maximum variation for L of 0.2 lb. per square inch of furrow slice cross section and for V of 0.3 lb. for either bottom, with the width of cut varied from 8 to 16 in. for the 12-in. bottom and from 8 to 20 in. for the 16-in. bottom. Since there is no

definite trend it may be assumed that the width a bottom is cutting has very little effect upon *L* for this soil condition. The values of *S* tend to increase with increasing width, especially at the widths above the rated width of cut for the bottom, due in part at least to the force required to shear over the uncut portion of the furrow slice. *L*, *V*, and *S* are, respectively, the directional, vertical, and side components of forces acting on the plow bottom.

Landside friction was found to affect the draft of a plow markedly. Not only is *L* higher due to the landside friction, but the rate of increase in draft with speed is greater for the bottom with the landside attached, owing to the greater amount of friction caused by the higher side pressures at the higher speeds. The increase in draft varied from 1 lb. per square inch of furrow slice cross section at 3 m. p. h. to 2 lb. at 7 m. p. h. for the Davidson loam and from 1.5 to 1.9 lb. for the same speed range in the Norfolk sand. An efficient rolling landside or rear wheel can reduce this part of the draft markedly.

Placement of fertilizer for cotton, E. R. Collins, H. B. Mann, and G. A. Cumings. (Coop. U. S. D. A. et al.). (*North Carolina Sta. Bul. 318 (1938), pp. 38, figs. 16*).—A study of fertilizer placement for cotton was conducted on Norfolk sandy loam near Rocky Mount, N. C., during the period of 1931 to 1935, inclusive. A standard 4–8–4 fertilizer was used in the major part of the work, but an 8–16–8 mixture was also applied for certain treatments in the earlier experiments.

On flat prepared seedbeds, fertilizers placed either in a 1¾- or 3½-in. band at distances of 1, 2, 3, and 4 in. directly under the seed at time of planting delayed germination and reduced the stand of plants. These adverse effects were severe at the 1-in. depth and progressively became less marked at the deeper placements. Mixing of the fertilizer throughout the soil zone 3½ in. wide and 3 in. in depth, located under the seed, retarded germination and reduced the stand of plants particularly under the less favorable moisture conditions. Reduced yields for these treatments corresponded closely with the early adverse effects. On flat prepared seedbeds, fertilizer placed at time of planting in a narrow band at each side of the row in a zone ranging from 1½ to 3½ in. laterally from the seed and from 1 to 3 in. below seed level resulted in the most rapid germination and seedling growth as well as the highest yields of seed cotton. A band of fertilizer at only one side of the row gave similar results. With a side placement there was no advantage in applying a small amount of the fertilizer either in the furrow with the seed or in the surface soil above the seed.

Tests included only in the 1934 and 1935 experiments gave the highest yields of seed cotton when the land was bedded 2 weeks before planting and the fertilizer was applied at time of planting in a band 2½ in. to each side of the row 3 in. below seed level. Planting the seed in firm moist soil was evidently one of the factors which favored this method.

Bedding on the fertilizer about 2 weeks before planting the seed gave best results when the fertilizer was applied in a band 2½ in. to each side of the row compared to either a band centered on the row or mixing the fertilizer with the soil in the row. However, the advance-of-planting applications, as commonly made, were somewhat inferior to applying the fertilizer at time of planting in a band at each side of the row.

Side placement of fertilizer at 400, 800, and 1,200 lb. per acre of 4–8–4 mixture and at equivalent rates of 8–16–8 fertilizer on the average gave more rapid germination and a higher yield than did under-seed placements. The yield

differences between fertilizer placements were much more pronounced at the higher fertilizer rates than at the low rate.

When the initial fertilizer application was made at time of planting in a band at each side of the row, withholding and side dressing one-half of the mixture at time of thinning definitely reduced the yields, but withholding and side dressing one-half of the nitrogen appeared to be of slight advantage. Similar treatments with the initial application placed in a band directly under the seed were inferior to the side-placement group.

Under the conditions of this study most rapid germination of seed and growth of plants and the earliest maturing cotton and highest yields were obtained by placement of the fertilizer in a narrow band at each side of the row, irrespective of the amount of fertilizer or time of application. There is some indication that planting the seed in firm moist soil as is usually assured by forming raised beds several days in advance and then placing the fertilizer at time of planting in a narrow band 2½ in. to each side of the row, from 2 to 3 in. below seed level, was the most advantageous method used.

Vegetable growth as affected by location of heat cable in hot beds.—A progress report, H. N. Colby and E. F. Burk. (Wash. Expt. Sta.). (*In A Progress Report on the Investigation of the Various Uses of Electricity on the Farms of Washington for the year 1937*, L. J. Smith, H. N. Colby, and H. L. Garver. [*Pullman*]: *Wash. Com. Relat. Elect. Agr., 1937, pp. 20–30*).—Four 6- by 6-ft. hotbeds were used, heat being supplied by hotbed cable placed at several depths in the soil and above ground approximately as follows: (1) Suspended in air several inches above growing vegetables, (2) on the surface of the soil, (3) 11 in. below the soil surface, and (4) 4 in. below the soil surface. Vegetables representing the several types started in hotbeds for transplanting were grown under each condition and detailed observations made of the root and top growth of each kind as related to the position of the heating cable. These included radishes, cabbage, tomatoes, peppers, cucumbers, melons, lima beans, celery, lettuce, and New Zealand spinach.

The most noticeable result was that for both runs all vegetables in bed No. 2, where the cable was laid on the surface of the soil, came up first and gave the best growth. The average weekly soil temperature was the highest in this bed. The next highest average soil temperature occurred in bed No. 1, in which the next best final growth occurred. While the seeds did not germinate as quickly as in bed No. 2, the plants in bed No. 1 grew more rapidly as soon as they got up to where the heat could reach them. The general characteristics of the plants grown in bed No. 1 were tall, rather spindly stalks, with radishes and lettuce sending out seed stalks earlier in their development than in bed No. 2. This appeared to be due to the higher air temperature. There was little difference in rate of germination or growth in beds Nos. 3 and 4. The root systems were for the most part in proportion to the size of the plant above ground. The warm-season plants in bed No. 2 all had strikingly longer roots than the other beds. The cool-season plants did not show much difference in length. It is considered evident that for all factors concerned, with the exception of energy consumption, the location of the cable in the soil surface as in bed No. 2 is the most satisfactory. However, it is believed that the same results may be obtained with a lower energy consumption by pressing the cable down until it is buried under 0.25 in. of soil.

Preliminary analyses of the cooling of fruit packages, G. M. Dreosti (*Union So. Africa Dept. Agr. and Forestry, Rpt. Low Temp. Res. Lab., Capetown, 1933, pp. 52–60, figs. 3*).—This is a temperature study based upon the

physical characteristics of each type of fruit package tested. The preliminary experiments were carried out in the laboratory on a small scale with packages arranged in the simplest type of stack, a single tier of boxes, this consisting of five packages stacked vertically with 4 in. of cork insulation on the bottom, top, and ends of the tier. The data on cooling were taken in boxes 2, 3, and 4 as more representative of an infinite stack. The range of cooling in all cases was from 80° to 35° F., as this closely approximates commercial conditions. The air temperature in the chamber was held approximately constant at 15° throughout the whole of the cooling process, except where otherwise stated. Cooling experiments were varied from no forced movement of air up to air velocities past the sides of the boxes of 800 lin. ft. per minute, the direction of the air in movement in all cases being vertically downward.

During rapid cooling of individual fruits in air moving at 800 ft. per minute, wrapped fruit took approximately twice as long to cool as naked fruit. When packed in a box the wrapped fruit cools almost as rapidly as naked fruit, indicating that the lagging due to wrapping is almost completely eliminated by the greater lagging effect of the package. The fruit at the periphery of the boxes cools at approximately the same rate, but that in the center of the box cools more rapidly in woodwool-lined than in cardboard-lined boxes. Replacement of the corrugated cardboard by a thin sheet of metal such as aluminum foil results in only a slight improvement in the rate of cooling, the effect being greater on the side than on the center fruit.

The application of forced air movement reduces the time of cooling very considerably, the relative reduction being greater in the case of trays than in bushel boxes, and the difference between central and side fruits is also reduced. Although the cooling time of the side fruit may be reduced approximately the same extent by lowering the air temperature as by the application of forced air movement, the latter method is to be preferred on grounds of more even cooling of the fruit. In cooling by still air the temperature difference between central fruit and side fruit in a box of pears is smaller than in the more rapidly cooling trays of peaches and plums.

An air velocity of 100 lin. ft. per minute reduces the cooling time to half compared with air in convective movement only. In order to halve the cooling time at 100 ft. per minute again, it is necessary to increase the air velocity to 400 ft. per minute.

By lowering the air temperature the cooling time is reduced in approximately the inverse proportion of the increase of the mean temperature difference between fruit and air during the cooling (from 80° to 35°). The lag of temperature of the center fruit behind that of the fruit at the sides is, however, increased.

Small fruit cool somewhat more rapidly than large fruit without much effect on the temperature gradient in the case where the fruit is packed in nests of woodwool, e. g., peaches. In Californian boxes of pears where the fruits are in contact with each other, however, the temperature gradients appear to be slightly less for smaller fruit, as expected.

Spontaneous heating and ignition of hay, H. E. Roethe (U. S. D. A.). (*Agr. Engin.,* 18 (1937), No. 12, pp. 547–550, 554, fig. 1).—Supplementing laboratory investigations on chemical and microbiological problems of the spontaneous heating of hay, a series of 11 semi-large-scale experiments are reported. A wooden barn was used in these experiments with inside dimensions approximately 24 by 26 ft., a height from the floor to the ridge of the roof of about 22 ft., and a mow capacity of from 20 to 50 tons of long hay, depending upon the moisture content of the hay and the degree of packing.

In 2 of the 11 experiments well-cured baled alfalfa was placed in storage after the bales had been broken up and the hay loosened. As the dry hay was scattered in the mow it was sprinkled with water to bring the moisture content of the mass within the desired range. During filling operations in each experiment zones were established at various levels in the mow, and thermocouples were placed at selected locations in each zone for the determination of temperatures. Provision was made for the collection of samples of hay and of gas from the interior of the mow and for the introduction when desired of measured quantities of air or oxygen into the mass of hay during the progress of the experiments.

The maximum temperature produced in any experiment was 88° C. This temperature was reached in the mow composed of baled alfalfa hay containing 15.2 percent moisture, which was sprinkled with water to bring the average moisture content to approximately 50.5 percent. The tonnage of this wetted hay was 48. Maximum temperatures in the series of experiments were generally reached within 5 to 9 days after the hay was placed in storage.

Hay of a distinct brown color did not result if the moisture content of the hay as stored did not exceed approximately 30 percent. Samples of undercured alfalfa in metal baskets stored in the mows demonstrated the seriousness of the losses of organic substance caused by spontaneous heating. The greatest losses occurred in the two experiments in which the average moisture content of the hay was slightly more than 30 percent, but in which a large proportion of the hay was undercured hay of much higher moisture content. The maximum loss in these experiments was approximately 22 percent and the average loss nearly 14 percent. Losses in organic substance were found to involve chiefly the fats, the sugars, and the hemicelluloses, while there was a further loss of protein and cellulose under the more destructive conditions. Evidence was obtained of the partial or complete destruction of carotene.

Results of the investigation of gases formed in the mow undergoing spontaneous heating, interpreted in the light of the results of laboratory experiments on the absorption of oxygen by alfalfa hay under the influence of heat supplied from external sources, indicate that, along with the respiration processes of the living plant cell and the activity of micro-organisms, chemical oxidation also occurs throughout the whole range of temperature usually ascribed to biological agencies. The results further lend support to the view that in the spontaneous heating of hay unsaturated, easily oxidizable substances are formed, whose oxidation would partially account for the ready consumption of oxygen with the resultant production of heat. Analysis of the samples of gas collected in these experiments, in which maximum temperatures of from 56° to 88° were reached, failed to show positively the presence of any combustible or spontaneously flammable gas.

In two experiments one corner of the barn was partitioned off with wooden studding to form a small mow with two exposed sides, having a capacity of approximately 15 tons of long hay. The studding consisted of upright two-by-fours spaced 2 ft. on centers. In eight other experiments similar studding was used to provide the mow with one exposed side. Judged by its color and general appearance at the termination of each of these 10 experiments, undercured hay within approximately 6 ft. of an exposed side in most cases had not undergone severe self-heating. Even when this hay had an original moisture content as high as approximately 35 percent, it was found to be of good quality at the end of the storage period. These facts indicate that exposure of the hay on one or more sides of the mow facilitated the dissipation of the heat produced and the drying out of the mass. The division of large mows into

small compartments by means of alleyways or openwork partitions should aid materially in the accomplishment of these results in the storage of long hay in barns. Each compartment should not be over 12 ft., or possibly 14 feet., wide with at least two exposed sides paralleling each other.

In 4 of the 11 experiments the stored hay was elevated a short distance from the barn floor by means of an openwork support of wood which it was anticipated would increase natural aeration. The studding on the one exposed side of the mow was equipped at the floor level with close-fitting sliding boards by means of which the open end of each channel under the hay formed by the two-by-eights could be closed if desired. In the last of these four experiments the mow was divided into two compartments of equal size, 12 by 23 ft., separated by a partition of two-by-fours covered on each side with insulating board ⅞ in. thick. The false floor was placed in but one compartment. The two mows were built up jointly with first-cutting, long alfalfa hay, the first load being placed in the unventilated compartment, the second in the ventilated compartment, and so on. The following zones were established in each compartment: No. 1 at the 4-ft. level, No. 2 at the 7-ft. level, No. 3 at the 11-ft. level, and No. 4 at the 13-ft. level. Thirty-six thermocouples were placed at comparable locations in these zones, 18 in each compartment.

In all four zones the average temperature was greater in the unventilated mow than in the ventilated mow. There were greater average and maximum air velocities and also greater measurable velocities over a greater number of days in the ventilated mow than in the unventilated mow. Attention is called to the consistently higher oxygen content and the lower carbon dioxide content of all the samples collected from the ventilated mow, which definitely indicates a greater dilution of its gases.

There was practically no difference in the total loss of water from the hay in the ventilated and unventilated mows, and continuous observation of the hay as it was taken from corresponding levels in the two compartments showed no material difference between salted and unsalted hay with respect to color and mold development. The use of 1.5 percent by weight of salt added to 12.5 tons of long alfalfa hay averaging 35 percent moisture had no appreciable effect in preventing or retarding spontaneous heating.

AGRICULTURAL ECONOMICS

Agricultural economics: A selected list of references, compiled by M. G. Lacy (*U. S. Dept. Agr., Bur. Agr. Econ., Agr. Econ. Bibliog. 1, rev. (1938), pp. IV+26*).—This is a revision of the bibliography previously noted (E. S. R., 75, p. 411).

[Proceedings of the twenty-eighth annual meeting of the American Farm Economic Association] (*Jour. Farm Econ., 20 (1938), No. 1, pp. 401, figs. 18*).—Included are the following papers with discussions presented at the annual meeting held at Atlantic City, N. J., December 28–30, 1937 (E. S. R., 78, p. 263): New Horizons in Agricultural Economics, by M. L. Wilson (pp. 1–7); The Economics of the Ever-Normal Granary, by J. S. Davis (pp. 8–21); Objectives in National Agricultural Policy, by H. R. Tolley (pp. 24–36); Objectives in Our National Agricultural Policy, by B. H. Hibbard (pp. 37–48); Business Combinations and Agriculture, by G. C. Means (pp. 53–57); Prices and the Agricultural Problem, by D. S. Anderson (pp. 58–68); Disadvantaged Rural Classes, by L. C. Gray (pp. 71–85); Soil Conservation in European Farm Management, by S. von Ciriacy-Wantrup (pp. 86–101); Farm Management Aspects of Soil Conservation, by H. C. M. Case (pp. 102–114); Prospects for Industrial Uses for Farm Products,

by H. E. Barnard (pp. 119–133); Economic Aspects of New Industrial Outlets for Agricultural Products, by T. W. Schultz (pp. 134–139); What Should Be Done About Farm Tenancy, by H. C. Taylor (pp. 145–152); Problems of Croppers on Cotton Farms, by C. O. Brannen (pp. 153–158); Indirect Restrictions to Internal Trade, by F. V. Waugh (pp. 163–169); Market Prorates as Restrictions on Internal Trade, by H. E. Erdman (pp. 170–183); The Future of Milk Control, by J. M. Cassels (pp. 188–195); Western Cream for Eastern Markets, by L. Spencer (pp. 196–207); An Evaluation of Crop Insurance Possibilities, by R. M. Green (pp. 214–220); Land Use in the Northeast, by L. A. Salter, Jr., and R. H. Allen (pp. 223–229); Land Booms and Second Mortgages, by W. G. Murray (p. 230); Land Booms and the Mortgage Rate of Interest, by A. A. Dowell (pp. 231, 232); Conditions Characteristic of Land Booms, by R. C. Limber (pp. 233–235); Can Land Booms Be Avoided? by E. H. Thomson (pp. 235, 236); Goals in Land Use Policy, by G. S. Wehrwein (pp. 237–246); Goals in Conservation Policy, by W. E. Grimes (pp. 247–254); Flexible Payment Plans for Farm Mortgage Loans, by F. F. Hill (pp. 257–281); Place of Commercial Banks in Agricultural Finance, by N. J. Wall (pp. 282–297); Present Federal Reserve Policies, by M. Palyi (pp. 302–309); Inflation and the Price of Land, by L. H. Bean (pp. 310–320); Trade Agreements and Agriculture, by L. R. Edminster (pp. 325–337); The Outlook for Agricultural Exports, by L. A. Wheeler (pp. 338–351); Rural Electrification—Progress and Future Prospects, by J. M. Carmody (pp. 361–369); and Economic Aspects of Rural Electrification, by H. E. Pinches (pp. 370–382). The reports of the officers and committees of the association are also included.

Current Farm Economics, Oklahoma, [February 1938] (*Oklahoma Sta., Cur. Farm Econ., 11 (1938), No. 1, pp. 23, figs. 4*).—In addition to the usual tables of indexes of prices and purchasing power of Oklahoma farm products and demand deposits in Oklahoma, articles are included on Developments in Farm Mortgage Credit in Oklahoma (pp. 2–8) and Oklahoma Farm Prices Depend on Industrial Prosperity (pp. 16–21), both by T. R. Hedges; and The Poultry and Egg Situation for 1938 and 1939, by M. Hill and Hedges (pp. 8–15).

Foreign Agriculture, [March-April 1938] (*U. S. Dept. Agr., Bur. Agr. Econ., Foreign Agr., 2 (1938), Nos. 3, pp. 117–168, figs. 9; 4, pp. 169–210, pls. 2*).—Included in No. 3 are articles on Trends and Possibilities of Cotton Production in China, by F. J. Rossiter (pp. 110–146), and The Hog Industry in the Baltic States, by H. E. Reed (pp. 147–164), and notes on recent developments in foreign agricultural policy as follows: Iran adopts policy of national planning, Yucatán establishes new henequen control agency, and Nyasaland requires auction marketing of tobacco. No. 4 contains articles on The Indian Textile Industry and American Cotton, by R. Whitaker and W. Ladejinsky (pp. 171–192); Certain Economic Implications of the Austro-German Union, by L. V. Steere (pp. 193–198); and The Sino-Japanese Conflict—Effect on Chinese Agricultural Production and Trade, by F. J. Rossiter (pp. 199–206); and notes on recent developments in foreign agricultural policy as follows: Mexico considers new agricultural program, Argentina to regulate flour industry, Latvian agrarian policy, and Newfoundland developing agricultural industry.

United States agricultural trade with Canada, 1937 (*U. S. Dept. Agr., Bur. Agr. Econ., F. S. 74 (1938), pp. [2]+13*).—Tabulations analyze the trade between the United States and Canada, 1935, 1936, and 1937, broken down between agricultural and nonagricultural products. The text discusses the trends of exports of agricultural products from the United States to Canada and the trend of the trade in principal import items on which the United States granted duty reductions under the trade agreement. The principal developments in 1937 were a marked increase in exports to Canada of fruits and vegetables, an

increase in exports of grains to and through Canada, small exports of livestock and meat, continued large imports from Canada of cattle, reduced imports of cheese, and larger imports of hay, grass, and forage seeds.

The world wheat situation, 1936–37: A review of the crop year, J. S. Davis (*Wheat Studies, Food Res. Inst. [Stanford Univ.], 14 (1937), No. 4, pp. [2]+103–182, figs. 25*).—"For a third year in succession world wheat crops were short, utilization considerably exceeded production, and carry-overs were strikingly reduced—in the end to a very low point like that of 1925. Successive advances carried wheat prices up toward or above 1929–30 averages. . . .

"Government intervention played a minor role in the United States and in most wheat-exporting countries in 1936–37. Their wheat growers generally fared better than for several years and exceptionally well in Argentina and Australia. Elsewhere, despite temporary adjustments, wheat control policies were commonly maintained or tightened, with war fears a powerful influence. At current restricted levels of wheat utilization, a new surplus problem threatens to emerge when good yields per sown acre are again obtained."

Nonagricultural income as a measure of domestic demand, L. H. Bean, P. H. Bollinger, and O. V. Wells (*U. S. Dept. Agr., Agr. Adjust. Admin., 1937, pp. IV+45, figs. 13*).—"The purpose of this bulletin is to make more generally available a monthly index of nonfarm income which has been found useful in the analyses of agricultural price fluctuations, particularly by price analysts in the commodity sections of the Agricultural Adjustment Administration." The new index for all practical purposes may be considered "as a monthly index of the national income paid out to individuals, exclusive of that arising in agriculture, corresponding with minor qualifications to the annual estimates of the Department of Commerce." It includes three basic monthly series available since 1929—a composite of all labor income exclusive of the income of farm labor, a composite of income withdrawn from businesses by their owners, and one representative of property income excluding agriculture. The monthly index of nonagricultural income for the period 1919–37 is developed in two sections, one for 1929–37 and the other for 1919–29. Another section develops a monthly series of the contribution of agriculture to national income from 1924 to 1937. Appendixes include tables and charts with discussion showing the money income of farmers and industrial workers and selected retail expenditures and income of urban consumers, 1919–33.

Some economic and social aspects of irrigation in Montana, P. L. Slagsvold and J. D. Mathews (*Montana Sta. Bul. 354 (1938), pp. 24, figs. 4*).—This bulletin discusses the importance of irrigation in the State in stabilizing agricultural production and income and in community development, and the influence of irrigated agriculture upon county government. Yellowstone County is used as the basis for most of the analysis. In the analyses tables, charts, and maps are included presenting data as to crop failures and crop values on dry and irrigated lands, the relation of population density to school costs, availability of home conveniences, relation of irrigation development to industry and trade, and tax status and landownership.

Outstanding farm-mortgage loans of leading lending agencies, N. J. Wall (*U. S. Dept. Agr., Bur. Agr. Econ., 1937, pp. [3]+51, figs. 10*).—Data presented by States for the period 1930–37 show the changes in farm mortgage holdings of Federal land banks, land bank commissioner, life insurance companies, joint stock land banks, commercial banks, and the State-sponsored credit institutions of Minnesota, North Dakota, and South Dakota. Preliminary estimates of the amount of farm real estate held by the leading agencies are also included.

Farm mortgage loans of life insurance companies, A. M. WOODRUFF, JR. (*New Haven, Conn.: Yale Univ. Press, 1937, pp. XII+204, [pl. 1], figs. [6]*).—This is a David A. Wells prize essay to which Williams College made the award. "The purpose of this book is to answer two questions—(1) under what circumstances were farm mortgage loans of life insurance companies made, [and] (2) how have they survived the economic crisis and depression following 1929?"

How loans were made, the lending history 1910–30, and the nature of the mortgage security are described. Foreclosures prior to 1929 and in the period 1929–36, the handling of delinquencies and foreclosures, and the effects of foreclosures on the companies are discussed. Part 3, depression legislation affecting the mortgage investment, describes and discusses the obstacles placed in the way of the liquidation of loans by foreclosure riots, State moratorium legislation and the Frazier-Lemke Act approved March 3, 1933, amending the National Bankruptcy Act, and the aids given to liquidation by the Agricultural Adjustment Act approved May 12, 1933, and the Federal financing of farm loans under the Emergency Farm Mortgage Act approved May 12, 1933, and the Federal Farm Mortgage Corporation Act approved January 31, 1934.

Tenancy trends in Virginia, W. E. GARNETT (*Virginia Sta., R. S. Mimeogr. Rpt. 4 (1937), pp. [1]+6*).—This is a statement prepared at the request of the National Tenancy Commission. It describes the existing conditions and suggests methods for bringing about improvements.

Distribution of hired farm laborers in the United States, J. T. WENDZEL (*U. S. Dept. Labor, Bur. Labor Statis., Mo. Labor Rev., 45 (1937), No. 3, pp. 561–568, fig. 1*).—Tables and charts are included and discussed showing by States and geographic divisions the numbers and percentages of farms using different numbers of hired laborers, January 1935, the numbers of such laborers, the seasonal distribution (January and July 1935), etc. It is based largely on unpublished data tabulated by the U. S. Bureau of the Census.

Seasonal labor needs for California crops, R. L. ADAMS (*California Sta. Mimeogr. Rpt. 53, Prog. Rpts. 1 (1936), pp. [1]+16; 4, pp. [1]+21; 6, pp. [1]+17; 7, pp. [1]+18; 10 (1937), pp. [1]+26; 11 (1936), pp. [1]+19; 13, pp. [1]+21; 15 (1937), pp. [1]+24; 16, pp. [1]+16; 17 (1936), pp. [1]+14; 19, pp. [1]+37; 20 (1937), pp. [1]+16; 23 (1936), pp. [1]+13; 24 (1937), pp. [1]+23; 27 (1936), pp. [1]+28; 28, pp. [1]+14; 30, pp. [1]+25; 33, pp. [1]+40; 34, pp. [1]+23; 35, pp. [1]+24; 36, pp. [1]+20; 37 (1937), pp. [1]+20; 39, pp. [1]+32; 40 (1936), pp. [1]+15; 42, pp. [1]+20; 43, pp. [1]+18; 44, pp. [1]+19; 48, pp. [1]+17; 49, pp. [1]+19; 50 (1937), pp. [1]+27; 51 (1936), pp. [1]+22; 52, pp. [1]+15; 54 (1937), pp. [1]+28; 56 (1936), pp. [1]+18; 57, pp. [1]+18; 58 (1937), pp. [1]+17; 59, pp. [1]+27*).—This is a series of mimeographed progress reports by counties. The reports include tables showing (1) the time the labor is needed, percentage of labor done by seasonal laborers, and output per man-day for different operations for different crops; and (2) by months crops and tasks requiring labor, size of task, output per man-day, man-days of labor required, days available for the work, and number of workers required.

Seasonal agricultural labor in the Yakima Valley, P. H. LANDIS (*U. S. Dept. Labor, Bur. Labor Statis., Mo. Labor Rev., 45 (1937), No. 2, pp. 301–311, figs. 2*).—This article presents some of the findings as to the numbers of resident and nonresident laborers employed on general and fruit crops, the man-days of such labor, seasonal variations in the amount of labor used, income of laborers, etc. It is based on the study of the Washington Experiment Station previously noted (E. S. R., 77, p. 265).

Bibliography on land utilization, 1918–36, compiled by L. O. Bercaw and A. M. Hannay (*U. S. Dept. Agr., Misc. Pub. 284* (*1938*), *pp. IV+1508*).—This bibliography, compiled as a companion volume to the bibliography on land settlement (E. S. R., 72, p. 403), includes over 7,300 selected references with descriptive notes on the economic aspects of land utilization in its broader aspects and land policy in the United States and foreign countries. References to special phases, such as farm management, urban land uses, migration, etc., have been omitted, and only a few references have been included on such subjects as soils, soil erosion, forest shelterbelts, general economic planning, regional planning, and forests and afforestation. References are included on land settlement and resettlement, subsistence homesteads, agrarian reform, tenancy, and tenure (except borough tenure and individual manors). No systematic examination was made of statistical material. Legislation as found in collections of laws and statutes is not covered, but reproductions of texts of laws accompanied by discussion of their provisions have been included. The bibliography is divided into three parts, one including general references, one relating to the United States and the States and Territories, and one relating to foreign countries. An author and subject index follows the references.

Land utilization: A bibliography, compiled by D. C. Culver (*Berkeley: Univ. Calif., 1937, rev., pp.* [*I*]*+IX+222; Sup., pp.* [*I*]*+VI+139*).—This bibliography, published May 15, 1935, includes 2,887 references grouped under the headings of public lands, land classification, land utilization, land finance, and land protection. The four groups are further subdivided as follows: Public lands—State lands and disposal of public lands (with subdivisions); land classification—land surveys (geological and soil); land utilization—marginal lands, economic surveys, land use planning (with subdivisions), and land uses (with subdivisions on agricultural lands, community stabilization, forestry, recreation, wildlife conservation, social welfare, and water conservation and power development); land finance—farm mortgages, taxation, and tax delinquency; and land protection—erosion, coast erosion, wind erosion, and flood control. The supplement, published November 13, 1937, includes in the section on State planning, by States, only reports general in character or specifically on land use.

A selected bibliography on management of western ranges, livestock, and wildlife, F. G. Renner, E. C. Crafts, T. C. Hartman, and L. Ellison (*U. S. Dept. Agr., Misc. Pub. 281* (*1938*), *pp. II+468*).—This bibliography of nearly 8,300 references covers the more important American publications relating to grazing lands in the 17 Western States and Alaska, livestock and wildlife thereon, and the management of such lands, livestock, and wildlife. The references to Federal Government, State agricultural experiment stations, and the more important popular magazines and scientific journals are reasonably complete through 1933, and some of the more important references from 1934 to 1937 are given. The references are grouped under range plants with subdivisions on systematic botany, economic value, forage value, poisonous plants, ecology, physiology and morphology, pathology, and genetics; range management, with subdivisions on surveys and plans, utilization and maintenance, distribution and control of livestock, and range development; range livestock, with subdivisions on cattle and horses, sheep and goats, and management; range influences—forest growth and replacement, fire, watershed protection, game, and recreational uses; range and livestock economics, with subdivisions on land utilization, cost of production, marketing, associations, and coordination of range and ranch; wildlife management; range research; and range education.

Historical and geographic aspects of wheat yields in Washington, B. H. Pubols and C. P. Heisig (*Washington Sta. Bul. 355 (1937), pp. 30, figs. 10*).—Tables show for the State the acreages harvested, production, and yield per acre for all wheat, 1879–1937, and winter and spring wheat separately, 1900–1937. Charts show the trends in acreages and yields. Maps show the location of lands in southeastern Washington with average yields per acre, 1929–32, of less than 5 bu., from 5 to 9.9, from 10 to 14.9, from 15 to 19.9, from 20 to 24.9, and over 25 bu. Other tables show the distribution of acreages (1929–32) and production in the Palouse-South Snake River, Big Bend, and Benton-Klickitat areas, and the total wheat region by 5-bu. yield groups from 0–4.9 to 55–59.9 bu.

Historical trend in Massachusetts industries, 1837–1933, D. Rozman and R. E. Sherburne (*Massachusetts Sta. Bul. 340 (1938), pp. 31, figs. 150*).—"The statistics in this volume are presented in a series of charts indicating the trend of population, number of manufacturing establishments, and number of employees for 142 cities and towns, beginning with 1837 or a later date as statistics became available."

A picture of the asparagus industry for New Jersey farmers, K. R. Slamp and L. A. Bevan (*New Jersey Stas. Bul. 641 (1938), pp. 20, figs. 14*).—The growth and present status of the asparagus industry in New Jersey and the United States, including changes in production, trends in acreage, markets, prices, the canning and quick-freezing situation, etc., are discussed.

Seasonal variations of prices and marketings of Minnesota agricultural products, 1921–1935, W. C. Waite and R. W. Cox (*Minnesota Sta. Tech. Bul. 127 (1938), pp. 59, figs. 16*).—An analysis is made of the seasonal movements during the period of the prices and marketing receipts and production of butter, eggs, top steers, stockers and feeders, hogs, lambs, No. 2 hard winter and No. 1 northern spring wheat, corn, oats, flax, and potatoes, and the types and regularity of price movements, market movements and utilization, and the variations of the movements among years are discussed. For each series the trend of the movement was established by computing a 13-mo. moving average of the original items, and an index of irregularity (the average deviation of the percentages of trend for particular months about the value of the index of average seasonal variation) and an amplitude ratio using the formula

$$a=\frac{\Sigma ds}{\Sigma s^2},$$

in which d is the percentage deviation of the individual month from the moving average of the month and s is the deviation of the index of average seasonal variation from 100, were computed. The probability of an underlying seasonal movement at a given period of the year was determined by counting the increases and decreases from the preceding month. Computations were also made of profits and losses that would have resulted from commercial storage operations. In a few cases indexes of variation were computed to show a greater or smaller than usual change during the year.

The range of fluctuation in the index of average seasonal variation in prices varied from 6 for flax to 8.6 for No. 2 hard winter wheat, from 11.9 for oats to 19.5 for butter in the case of oats, potatoes, cattle, corn, and butter, 20 and 24, respectively, for lambs and hogs, and 57.8 for eggs. The average indexes of irregularity were 17.2 for potatoes and from 4.4 to 7.8 for other commodities. The average deviation of amplitude ratios ranged from 0.22 to 0.49 for hogs, eggs, lambs, stockers and feeders, and butter; were 0.62 and 0.7, respectively,

for corn and top steers; and ranged from 1.04 for oats to 1.74 for No. 2 hard winter wheat in the case of oats, No. 1 northern spring wheat, potatoes, flax, and No. 2 hard winter wheat. Month-to-month changes in prices of crops were highly irregular, and only a few months meet the statistical test for evidence of an underlying seasonal movement. In the case of livestock and livestock products the movements tended to be sustained for longer periods of the year and, with the exception of cattle, half or more of the months gave evidence of a dominant seasonal movement. Market receipts or production of all the products showed a greater range in average seasonal movement than did prices. The movements for all except corn were more regular than the prices. The average seasonal rise of prices of crops following harvest was not sufficient to have materially increased the average price received under any regular plan of marketing followed consistently from year to year. Wheat, oats, flax, corn, and potatoes showed sufficient variations between years so that gains could have been secured by selecting different periods of sales in the various years.

Cotton marketing in the Salisbury area of North Carolina, J. W. Wright, G. R. Smith, and J. A. Shanklin. (Coop. U. S. D. A.). (*North Carolina Sta. Bul. 317 (1937), pp. 58, figs. 4*).—This study was made to determine the relation of local marketing practices to community cotton improvement. A survey of 161 cotton growers selected at random before the 1935–36 marketing season was made to obtain information as to marketing practices, attitudes of growers, and their knowledge of the quality and market value of their cotton. All local marketing agencies were interviewed as to their operations during the 1934–35 season, and all cotton manufacturers operating within the area as to sources and qualities of cotton consumed and their procedures in purchasing raw cotton in 1934–35 and 1935–36. Classification and market news services were operated by the Bureau of Agricultural Economics during the 1935–36 and 1936–37 marketing seasons. Resurveys of the growers were made at the close of the 1935–36 and the 1936–37 marketing seasons to ascertain the reaction to the classification and market news services provided. This bulletin presents the factual material concerning the marketing situation in the area, the results of the tests of the marketing services provided, and tentative conclusions relative to possibilities for improvements in the marketing system of the area. Cotton production and consumption within the area, market outlets for cotton, the local market organization and procedures, purchasing practices of the local mills, and the results of the classification and news market services are discussed.

The classification and marketing news services were not particularly effective in influencing local marketing practices from the standpoint of recognition of quality of individual lots in grower-first-buyer transactions. The appreciation of and demand for classification and market news services were found to be limited to relatively few growers and a minority of the marketing agencies.

"The apathy of most cotton growers in the area toward making use of services designed to improve their bargaining position is attributable primarily to two conditions: (1) Cotton is a minor farm enterprise, so that from an economic standpoint there appears to be very little justification for incurring extra inconvenience and expense in an attempt to secure exact market value based on the merits of each individual bale, and (2) local buyers show preference for cotton ginned at their plants and thus discourage farmers in obtaining several bids before sale."

Decline in egg quality during the marketing process, H. E. Erdman and G. B. Alcorn (*California Sta. Mimeogr. Rpt. 63 (1938), pp. 16, figs. 5*).—

This study consisted of the candling and breaking out at intervals during a 2-week period of eggs from the same flock but kept under two sets of conditions. One set represented the conditions of summer in a San Fernando Valley feed room followed by shipment to Los Angeles where the eggs were kept on the warehouse floor during the period commonly taken for eggs to move to the consumer. In the second set the eggs were kept in a burlap cooler on the farm and in a merchandising cooler at about 48° F. in the warehouse. The tests were triplicated, with the second and third lots being started 2 and 9 days, respectively, after the first lot. The Van Wagenen breakout method was used in determining the scores.

The cooler lots showed a better breakout score throughout the period, the average score of the three lots being 1.83 on the first day, 2.66 on the third day, and 2.89 on the twelfth day, as compared with 2.04, 2.79, and 3.67, respectively, for the noncooler lots. The noncooler eggs showed a rather steady increase in intensity of yolk shadow, the score being 1.82 the first day and 4.27 the twelfth day, as compared with 1.56 on the first day and 3.28 on the twelfth day for the cooler eggs.

The greatest increase in depth of air cell occurred during the first 3 days, averaging 2.19 and 2.04 sixteenths of an inch for noncooler and cooler eggs, respectively, on the third day. Both lots showed further gradual and similar increases to the end of the holding period.

A survey of milk marketing in Milwaukee (*U. S. Dept. Agr., Agr. Adjust. Admin., Market Inform. Ser., 1937, DM–1, pp. IV+119, figs. 21*).—The major purpose of this study made by the Civil Works Administration, the Federal Emergency Relief Administration, and the Agricultural Adjustment Administration was to determine the feasibility of centralizing milk distribution in Milwaukee, Wis. "The first three parts of this report set forth factual data relative to the market, including (1) the general economic characteristics of the market, (2) market distribution, and (3) an appraisal of the present system. Part 4 presents details of the organization and operation of a proposed central plant and a comparison of this plant with the present system."

Some problems involved in establishing milk prices, E. W. Gaumnitz and O. M. Reed (*U. S. Dept. Agr., Agr. Adjust. Admin., Market Inform. Ser., 1937, DM–2, pp. IV+227, figs. 47*).—This is an introductory inquiry into the nature of prices in fluid-milk markets and into some of the problems encountered in pricing milk. It is limited primarily to consideration of factors affecting the structure of prices charged distributors and prices received by producers. "Chapter 1 is largely a description of the dairy industry in the United States, dealing with such information as trends in production, farm utilization, production of manufactured dairy products, and farm prices of dairy products. Chapter 2 describes in a general way some aspects of fluid-milk markets, while chapter 3 includes descriptive material relative to the demand for and supply of milk. Chapter 4 deals with the development of the general theory of milk prices. In this chapter simple markets are first considered, and then more complex aspects of milk markets are introduced by varying the assumptions as to types of markets. In chapter 5 some problems in pricing milk are discussed, and in chapter 6 the discussion is focused upon problems encountered in prorating among producers the proceeds of sales to distributors. Chapter 7 sets forth certain considerations relative to public policy and the milk trade."

Operating problems of farmers' elevators in Nebraska, L. F. Garey (*Nebraska Sta. Bul. 314 (1938), pp. 29, figs. 5*).—This report is based primarily on analysis of annual audit reports on farmers' elevators for the years 1922–35,

inclusive. The number of reports in the several years varied from 54 to 107 and represented about 20 percent of the farmers' elevators in the State. Tables and maps are included and discussed showing the financial progress of farmers' elevators, the capital structure, trade areas and competition, income, and expenses. The problems confronting country elevators are discussed briefly.

The average net income of the elevators studied varied from $143 in 1932 to $3,354 in 1928, averaging $1,553, or $9.70 per $100 capital stock. The percentage of elevators having gains varied from 30 in 1932 to 89 in 1928, averaging 65. The ratio of net worth to fixed assets during the period varied from 1.3 to 1.7, averaging 1.6 (safe ratio 1.5), that of sales to fixed assets from 2.6 to 18.6, averaging 9.5 (safe ratio 8), that of current assets to current liabilities from 1.4 to 7, averaging 2.5 (safe ratio 2), and that of cash and receivables to current liabilities from 0.48 to 2.96, averaging 1.21 (safe ratio 1). The percentages of gross income from grain varied from approximately 73 to 87.5, averaging 79.1. Fixed expenses constituted from 24.2 to 33.3, averaging 28.8, percent of the total expenses. Of the total expenses, interest constituted 7.2 percent, insurance 4.8, taxes 5.6, rent 0.7, depreciation 10.5, salaries and wages 50.8, office expenses supplies, advertising, dues, and miscellaneous 10.6, power and light, repairs, and truck and travel 7.8, and bad debts 2 percent.

The cost per bushel of handling grain in 1928 (year of high prices) was 7 ct. in elevators handling under 100,000 bu. and 2.8 ct. in the larger-size groups. In 1932 (year of low prices) it was 6.2 ct. in the under-100,000-bu. group, 3.5 ct. in the 100,000- to 199,000-bu. group, 2.5 ct. in the 200,000- to 299,000-bu. group, and 1.9 ct. in the 300,000-bu.-and-over group. The capacity turn-over in the years 1924, 1928, 1932, and 1935 varied from 2.4 to 2.7 for the under-100,000-bu. group, from 4.2 to 6 for the 100,000- to 199,000-bu. group, from 6.9 to 9.8 for the 200,000- to 299,000-bu. group, and from 8.3 to 11 for the 300,000-bu.-and-over group (satisfactory rate 10).

Producers and consumers: A study in co-operative relations, M. Digby (*London: P. S. King & Son, 1938, 2. ed., rev. and enl., pp. VI+254*).—This is a revision of the book previously noted (E. S. R., 60, p. 590).

Crops and Markets, [February–March 1938] (*U. S. Dept. Agr., Crops and Markets, 15 (1938), Nos. 2, pp. 17–48, figs. 4; 3, pp. 49–68, figs. 5*).—Both numbers include market reports of the usual types. No. 2 includes tables showing the monthly marketings by farmers of cotton, 1924–36; farm labor supply and demand, January 1, 1937 and 1938; average wage rates paid hired farm labor, January 1, 1937 and 1938 by States; corn:hog ratios by months and States, 1935–37; numbers and value of livestock on farms, January 1, 1936, 1937, and 1938 (preliminary) by States; average prices by States received by farmers for farm products, January 15, 1937 and 1938, and yearly prices (United States averages) received for livestock and livestock products; numbers of sheep and lambs by States on feed, January 1, 1935–38; and wheat stocks in interior mills, elevators, and warehouses, January 1, 1935–38. No. 3 includes crop and livestock production reports of the usual types and seasonal reports on indicated production of citrus fruit, mohair and wool production, and the prospective plantings of specified crops by States in 1938.

Annual report on tobacco statistics, 1937 (*U. S. Dept. Agr., Statis. Bul. 63 (1938), pp. 110, figs. 3*).—This is a continuation of the series previously noted (E. S. R., 77, p. 719).

The preparation of statistical tables: A handbook (*U. S. Dept. Agr., Bur. Agr. Econ., 1937, pp. V+35*).—This handbook was prepared for use in composing statistical tables for printed and duplicated publications.

RURAL SOCIOLOGY

Report of the Administrator of the Resettlement Administration, 1937, W. W. ALEXANDER (*U. S. Dept. Agr., Resettlement Admin. Rpt., 1937, pp. 19*).—This is the report to the Secretary on the work in the year ended June 30, 1937, presenting results obtained in rural rehabilitation, land utilization, rural resettlement, and suburban resettlement.

The population of Louisiana: Its composition and changes, T. L. SMITH (*Louisiana Sta. Bul. 293 (1937), pp. V+99, figs. 36*).—This second bulletin of the series (E. S. R., 74, p. 719) deals with the numbers and trends in race and nativity, residence, age, sex, marital condition, illiteracy, and occupation of the population of Louisiana, and makes comparisons with other Southern States and the United States. The implications of the changes are discussed.

The population of the State is very heterogeneous, and foreign-born groups are more important than elsewhere in the South. The percentage of rural population is higher than the average for the United States but lower than the remainder of the Southern States. The proportion of children is high, and a deficiency of persons of productive ages exists. Females outnumber males. In proportion to the population there are few single, many married and widowed, and few divorced persons. The proportion of illiteracy in 1930 was three times that of the United States and exceeded only by South Carolina. It is concentrated more largely in the younger ages than in other Southern States or the United States. Agriculture is the dominant gainful occupation but less so than in other Southern States. Commerce is relatively more important than in other Southern States or the United States. The racial make-up of the population is changing rapidly, with the foreign element disappearing and the negro losing in relative numerical importance. The population is urbanizing rapidly, and the average age is rapidly increasing. The proportion of females is becoming larger. The percentage married has increased significantly. Illiteracy is decreasing very rapidly. A decreasing proportion of the population is participating directly in agriculture.

Rural population mobility in South Dakota (1928–1935), W. F. KUMLIEN, R. L. MCNAMARA, and Z. E. BANKERT. (Coop. U. S. D. A. et al.). (*South Dakota Sta. Bul. 315 (1938), pp. 36, figs. 18; Sup., pp. [28]*).—This study was conducted in six rural counties, representative of distinct farming areas of the State, and included 12,088 households with 32,154 adults, of which about two-thirds were in the open country and one-third in villages. Mobility was measured through two main groups—heads of households or families living in the counties, January 1, 1935, and adult children of the heads of households. Analyses are made to show the nature and extent of migration, and the effects of composition of household, type of dependents, sex, age, and occupation on the mobility of the population. Only a few of the tables prepared in the analyses are included in the bulletin, the others being available in the supplement.

Three-fourths of the households had occupied the same residence throughout the period. As compared with open country population, more persons in villages were reared outside of South Dakota, the heads of families were older, and there was a slightly greater tendency to change residence. Children from both relief and nonrelief households tended to leave the open country for population centers. Two-thirds of the heads of families did not change occupation during the period. Relief families indicated a tendency to change residence a number of times without change in occupation.

The normal white share-cropper family with grown children, D. DICKINS (*Jour. Farm Econ., 19 (1937), No. 3, pp. 814–817*).—Essentially noted from another source (E. S. R., 78, p. 878).

A method of determining rural social sub-areas with application to Ohio.—I, Text and maps. II, Appendices, C. E. LIVELY and R. B. ALMACK (*Ohio State Univ., Dept. Rural Econ. Mimeogr. Bul. 106 (1938), pp. [2]+57, pls. 20*).—All available indices, totaling 111, of social and economic variation on a county basis were assembled and examined. The number was reduced to 83 by discarding those that were unreliable, the least desirable of 2 or more measuring the same situation, and overlapping indices. These 83 first-order factors were classified into groups and subgroups, as rural population, economic, school, church, social organization, and professional service factors. Correlation analysis was applied to the factors in each subgroup, and the "related" factors in each subgroup were withdrawn and designated as second-order factors, of which there were 32. All possible intercorrelations of these factors were computed within the groups, and those factors which had the highest relation to the largest number of factors or which were unrelated to other factors were withdrawn to form the third-order factors, of which there were 16. Groupings were not discarded and all possible intercorrelations made of the third-order factors and on the basis of closest relation to the largest number of factors. Three factors—gross cash income per farm, rural plane of living index, and rural population fertility ratio—were withdrawn and designated as fourth-order factors. These fourth-order factors were not highly correlated among themselves, and most of the third-order factors were related to one or more of them, with a correlation coefficient of 0.6 or above. The rural social subareas of the State were determined, using these three factors. These subareas are described and discussed. Correlation of the three fourth-order factors with 36 first- and second-order factors retained in the analysis showed that gross cash income had a slightly higher relation to the entire 36 factors than either of the others, but that rural plane of living index related to the largest number (20) of the factors to the extent of 0.6 or above.

Part 1 contains the text and maps and part 2 supplementary statistical material and notes on the methodology of the study.

Rural poverty: A study of human erosion in rural Virginia, W. E. GARNETT and A. D. EDWARDS (*Virginia Sta., [R. S.] Mimeogr. Rpt. 5 (1938), pp. [1]+28, figs. 7*).—This is a progress report on the study of the marginal rural population of the State, made in cooperation with the Virginia State Planning Board, the Works Progress Administration, and other agencies. The incomes, tax payments, living and cultural conditions, etc., of farm owners, tenants, and laborers are discussed.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Directory of organization and field activities of the Department of Agriculture, compiled by E. STEPHENS (*U. S. Dept. Agr., Misc. Pub. 304 (1938), pp. IV+194*).—The first part of this publication (pp. 1–103) lists the organization structure of the bureaus and offices of the U. S. Department of Agriculture. It supersedes Miscellaneous Publication No. 233 (E. S. R., 75, p. 130). The number of personnel listed for activities other than research has been reduced to the supervisory personnel at each location. In the second part (pp. 104–165) the field activities of the Department are given by States, cities, and towns. An alphabetical index of all names is included.

Workers in subjects pertaining to agriculture in land-grant colleges and experiment stations, 1937–38, M. A. Agnew (*U. S. Dept. Agr., Misc. Pub. 299 (1938), pp. V+140*).—This is the usual annual list (E. S. R., 77, p. 128) showing the workers in agriculture and home economics in the land-grant colleges and the agricultural experiment stations, the technical personnel of the Office of Experiment Stations, and the officers and standing committees of the Association of Land-grant Colleges and Universities.

***Studies and research in home economics education reported by colleges* and universities, with subject index and supplement indicating studies reported in published form** (*U. S. Dept. Int., Off. Ed. Misc. 1163, rev. (1937), pp. [113]*).—The studies are reported by institutions and by States and years. A supplement indicates those reported in published form. The lists are revised to February 1937.

Subject index of the theses studies in home economics education listed in Misc. 1163 (*U. S. Dept. Int., Off. Ed. Misc. 1173, rev. (1937), pp. [1]+IV+32*).—This is a subject index of the theses studies listed in the publication noted above. The theses are referred to only by number and institution.

Food buying and our markets, D. Monroe, H. Kyrk, and U. B. Stone (*New York: M. Barrows & Co., 1938, rev. and enl. ed., pp. X+430, [figs. 4]*).—A revised and enlarged edition of this textbook (E. S. R., 53, p. 899).

Financing agriculture, L. J. Norton (*Danville, Ill.; Interstate, 1938, pp. [325, figs. 35]*).—The material in this textbook is presented under the following headings: The sources of capital used in agriculture, the sources of borrowed capital used by farmers, lending limits of different types of institutions, how short-term loan capital accumulates or moves into a community, how long-term loan capital moves into a community, factors influencing interest rates, wise use of credit, bases used in extending credit to farmers, legal problems related to farm credit, making long-term loans, some problems in long-term loans, making short-term loans, making intermediate-term or chattel-capital loans, collection and repayment procedures, financing storage of farm products, merchant credit, financing marketing and other farm service agencies, financing cooperative organizations, cooperative financing institutions, the Farm Credit Administration, financing low income farmers, price trends and farm financing, and individual farm financing programs. Appendixes include references for additional reading, a summary of the farm land appraisal report used by the Aetna Life Insurance Company, sections of the rules and regulations for production credit associations relating to loans, and an article (pp. 292–319) by W. L. Rust on Problems of the Federal Land Bank in Servicing Loans in Illinois.

Analyses of special jobs in quality milk production. Procedures and practices for quality milk production on farms. (Coop. U. S. D. A.). (*U. S. Dept. Int., Off. Ed., Vocat. Ed. Bul. 154, rev. (1937), pp. V+15*).—The aim of this bulletin, prepared in cooperation with the Bureau of Dairy Industry, is "to provide teachers of vocational agriculture with current, reliable subject matter, organized in teaching form, which will enable them to offer systematic instruction on certain quality milk jobs occurring in dairy enterprises."

FOODS—HUMAN NUTRITION

Weights of food materials used in food preparation, E. F. Whiteman and F. B. King. (U. S. D. A.). (*Jour. Home Econ., 29 (1937), No. 9, pp. 641–644*).—A table is presented showing the weights of a number of common food materials as measured for use in food preparation. It was prepared from work on food weights carried on in the Bureau of Home Economics.

Factors which affect the quality of canned tomatoes.—II, A study of the physical and chemical constituents of Arkansas Marglobe and Greater Baltimore tomatoes, M. E. SMITH. (Univ. Ark.). (*Fruit Prod. Jour. and Amer. Vinegar Indus.*, *15* (*1936*), *No. 12*, *pp. 365–370, 377, 379, figs. 4*).—In continuation of a previous study (E. S. R., 75, p. 719), the investigation of the factors affecting the quality of canned Marglobe tomatoes of the 1934 crop was extended to include similar tests on the 1935 crops of Marglobe and Greater Baltimore tomatoes obtained from two different sources. The Marglobe tomatoes were canned at intervals between July 30 and September 2 and the Greater Baltimore between August 25 and October 4.

The first part of the growing season was too wet for the fruit to develop normally and the latter part was too dry so that in both varieties only 3.6 percent graded No. 1, 45.7 No. 2, and 50.7 percent No. 3 and culls. None of the canned tomatoes were placed in the Fancy grade, 20 percent graded Extra Standard, and 80 percent Standard. The Greater Baltimore tomatoes graded about 10 percent higher than the Marglobe for aroma and flavor, but the latter variety contained a greater percentage of pectin and maintained its shape better when packed.

The results show significant correlations between the high temperature during July and August and the content of the total solids of the Marglobe tomatoes and between the temperature in degree days and the pH of the fresh and canned Greater Baltimore tomatoes. A highly significant correlation was found between the temperature expressed in degree days and the invert sugar content of the Marglobe tomatoes after inversion. No significant correlation was demonstrated in either variety between the temperature and the pectin content. As the temperature decreased there was a slight increase in the acidity of the fresh and canned tomato juice.

The calcium and phosphorus content of vegetables, I. NOBLE and E. G. HALLIDAY (*Jour. Home Econ.*, *29* (*1937*), *No. 9*, *pp. 637–640*).—The calcium and phosphorus content of 15 vegetables obtained from the retail market was determined before and after cooking. Expressed as milligrams per 100 g of raw vegetable, the following values are reported for calcium and phosphorus, respectively: Asparagus 19 and 68 mg, string beans 48 and 46, beets 32 and 32, broccoli 215 and 87, brussels sprouts 22 and 53, cabbage 48 and 22, two samples of carrots 32 and 42 and 22 and 27, cauliflower 27 and 40, yellow onions 20 and 26, white onions 22 and 62, parsnips 50 and 64, peas 20 and 99, rutabagas 44 and 16, spinach leaves 60 and 37, Hubbard squash 39 and 34, and white turnips 35 mg of calcium and 26 mg of phosphorus per 100 g.

The vegetables cooked in distilled water showed losses in calcium varying from about 5 to 25 percent. When cooked in Chicago city water, which contains about 30 p. p. m. of calcium, the beets, broccoli, cabbage, carrots, cauliflower, onions, parsnips, rutabagas, and turnips lost from about 5 to 17 percent of their calcium, while the asparagus, string beans, brussels sprouts, spinach, squash, and peas showed gains in calcium content ranging from about 6 to 27 percent. The phosphorus losses on cooking in both kinds of water ranged from about 10 to 45 percent. The calcium and phosphorus content of the vegetables on a four-serving portion basis is given for the raw vegetables and for those cooked in distilled and in Chicago city water. "For the most part, the samples of vegetables were lower in calcium and phosphorus than the averages compiled by Sherman."

Certain factors which affect the palatability and cost of roast beef served in institutions, G. E. VAIL and L. O'NEILL (*Jour. Amer. Dietet. Assoc.*, *13* (*1937*), *No. 1*, *pp. 34–39*).—The experimental work is presented in two parts.

In part 1 a pair of uniform standing rib roasts from opposite sides of the same carcass was roasted at constant oven temperatures of 285° and 450° F. to an internal temperature of 57° C. The results indicate that the lower oven temperature produced a more desirable roast which yielded 62 66-g slices as compared to 51 for the roast cooked at the higher temperature.

In part 2 the shear, press fluid, palatability, and cost of top round, clod, and rib cuts of U. S. Choice and U. S. Good grades of beef suitable for roasting in large quantities were compared. The roasts were cooked in a flat roasting pan on a wire rack at a constant temperature of 300° F. until the internal temperature reached 68° C. The U. S. Choice rib roast had a shrinkage loss of 25.36 percent, Good clod 24.94, Good rib 24.83, Choice top round 23.61, Good top round 23.52, and Choice clod 23.31 percent. The tenderness ranged from the more tender Choice clod cut, with a shear of 8.53 lb., to the Good top round, with a shear of 24.06 lb. The average press fluid contents were 4.36 and 8.53 cc in the rib cuts, 4.85 and 6.97 in the clod, and 12.97 and 15.53 cc in the top round cuts. The Good top round yielded 61 70-g servings at a calculated cost per serving of 5.25 ct., the Choice top round 57 at 5.55 ct., the Good clod 57 at 5.22 ct., the Choice clod 53 at 5.55 ct., the Choice rib 51 at 9.75 ct., and the Good rib 49 servings at 9.5 ct. per serving. The palatability committee rated the rib cuts most desirable for flavor of lean and tenderness, the clod cuts moderately desirable, and the Choice top round and the Good top round only slightly desirable for flavor and slightly tough. All the cuts were scored moderately juicy.

Recent advances in nutritional research, E. V. McCollum (*Jour. Amer. Dietet. Assoc., 14 (1938), No. 1, pp. 8–24*).—The author reviews the research findings on the nutritive requirements of different species of animals and man, discussing particularly the vitamins A, B_1, C, D, E; riboflavine; antipellagra factor; and the mineral elements iron, copper, manganese, cobalt, iodine, and magnesium. A bibliography lists 45 references.

A study of the influence of the interval between matings upon the reproductive performance of the albino rat, A. H. Smith, W. E. Anderson, and R. B. Hubbell (*Connecticut [New Haven] Sta. Bul. 406 (1938), pp. 83–105, figs. 6*).—This is the report of an investigation conducted over a period of 6 yr. at the station on the reproductive performance of selected groups of seven generations of albino rats. All the rats received a diet of "calf meal food" ad libitum, and pregnant and nursing mothers and young rats also received "paste food" ad libitum. The other rats were given 3 g of wheat embryo weekly and all except nursing young 1 g of dried yeast daily and 10 g of lettuce weekly. The composition of the calf meal food is linseed oil meal 15 percent, ground malted barley 10, wheat red dog flour 22, dried skim milk 15, oat flour 15, yellow corn meal 20, steamed bonemeal 1, ground limestone 1, and sodium chloride 1 percent. In the course of the experiment 1.5 percent soluble blood meal was substituted for an equal quantity of dried skim milk, 1 percent of yellow corn meal for limestone, and 0.25 percent of cod-liver oil reinforced with a concentrate containing 3,000 U. S. P. units of vitamin A and 400 of vitamin D per gram was added. The paste food contained casein 25 percent, whole milk powder 25, wheat embryo 20, and lard 30 percent.

The rats were first bred at from 110 to 120 days. At birth each litter was reduced to 8 and the young were weaned at 21 days. Each female was mated four times, brother and sister matings being avoided, and from the progeny of the last mating of each generation 18 females and from 6 to 8 males of average size and vigor were selected as breeders for the following generation. When an interval of 2 weeks was allowed between weaning of the litter and remating, the percentage fertility reached the high point of 91.8, the average number of

young per litter was 9.4, average percentage weaned per reduced litter 83.2, and the weaning weights of the young males averaged 43 g and the females 42 g. The bibliography contains 38 references to the literature.

The nature of the visual process, S. Hecht (*Bul. N. Y. Acad. Med., 2 ser., 14 (1938), No. 1, pp. 21–45, figs. 13*).—In this paper, which is one of the 1937 series of Harvey Lectures, the photochemical approach to the study of vision is reviewed, with 64 literature references.

Diet during childhood, D. F. Radusch (*Jour. Amer. Dental Assoc. and Dental Cosmos, 25 (1938), No. 1, pp. 122–133*).—The nutritional information as it applies to childhood is reviewed, and practical deductions and conclusions are drawn in this paper, which contains 34 literature references.

Food and health habits of students at Connecticut College, M. S. Chaney (*Jour. Home Econ., 30 (1938), No. 1, pp. 39–47*).—Data obtained from records kept over a 5-yr. period on the health conditions and the health and food habits of 2,859 girls are presented in this paper. The habits of a group of 346 girls whose records revealed them to be particularly susceptible to colds were compared with those of 198 girls who had practically no colds, and a greater prevalence of headaches, constipation, fatigue, and less regular habits as to hours of sleep, regularity of eating meals, and exercise was noted in the former group. A study of a group of 25 girls who were definitely under their optimal weight revealed a greater tendency to frequent colds, constipation, fatigue, and evidences of poor sleep and eating habits.

The food of the present-day Maya Indians of Yucatan, F. G. Benedict and M. Steggerda (*Carnegie Inst. Wash. Pub. 456 (1937), pp. 155–188*).—A study of the diet of Maya Indians conducted during 1932, 1934, and 1935 is presented, together with data on the general character of the food supply, the methods followed in food preparation, and the dietary habits which might furnish some information about the food habits in prehistoric times. Water, fat, nitrogen content, and energy value determinations were made on 48 separate items of the daily diet in the raw and cooked states and on 24 composite samples of the daily meals representing the food for each of 3 consecutive days for a family of 3 adults and for one or two series of 3 consecutive days each for 5 men. Urinary analyses were made on 4 of the men subjects. Records were kept of the type of food eaten at the evening meal by 28 men and of the daily corn consumption per Maya family in two towns in Yucatan. Some measure of the degree of muscular activity of 5 subjects was obtained by a comparison of the average caloric intake with the basal metabolism measurements made by the senior author (E. S. R., 65, p. 791) in 1931.

The daily energy intake averaged 2,565 total calories, only 66 percent above the basal needs as measured in the 5 subjects. Approximately 73 percent of the energy intake was obtained from corn. The daily protein intake averaged 74 g. The average urinary nitrogen excretion of the 4 subjects was 9.6 g or 178 mg per kilogram of body weight per day. "That the basal metabolism of the Maya is, on the average, 8 percent higher than the standards for white men cannot be explained by a protein-rich diet, an excessive caloric diet with luxus consumption, or the aftereffect of severe muscular exercise. Hence, their high basal metabolism must be ascribed either to an environmental or more probably a racial factor."

The basal metabolism of Southern Chinese women, A. C. Siddall and K. C. Kwok (*Chin. Jour. Physiol., 12 (1937), No. 4, pp. 389–396*).—The basal metabolic rate of 100 Cantonese women was determined, using the Sanborn-Benedict apparatus. The blood pressure, height, sitting height, weight, oxygen

consumption, mouth temperature, and pulse rate were measured in all subjects, and the lung volume was determined in 56 of the women.

The average weight was 43.5 kg, which is about 11 kg less than that of North American women, and the average height was 155.6 cm and the sitting height 83.1 cm, which correspond closely to the Western standards. The average pelidisi was 90, which is within the range of normal variation. The blood pressure averaged 95.6 mm systolic and 61.4 mm diastolic, the oxygen capacity averaged 167 cc per minute, the lung volume of 56 subjects averaged 2,394 cc, the mouth temperature showed an average range of from 36.7° to 37° C., and the average pulse rate was 69. Calculated according to the Aub-DuBois standard, the average basal metabolic rate for 31 subjects between 15 and 19 yr. of age, inclusive, was −7.6, 67 between 20 and 30 yr. −5.86, and 2 aged 33 and 36 yr. −5.5, and for the entire group −6.4.

Calcium and phosphorus balances of Chinese college women, L. C. Kung and H. L. Yeh (*Chin. Jour. Physiol., 12 (1937), No. 2, pp. 139–146*).—Three 4-day calcium and phosphorus balance experiments were carried out on five normal healthy college women from 21 to 23 yr. of age. The diet consisted of vegetables 450 g, fruits 150, soybean curd 50, egg 100, lean pork 80, lard 40, and soybean sauce 40 g, supplemented by sufficient rice and steamed white bread to meet the caloric requirements.

The average intake of calcium was 0.419 g per person or 9.2 mg per kilogram and of phosphorus was 0.972 g per person or 21.3 mg per kilogram of body weight per day. The total calcium excretion averaged 0.373 g and the phosphorus 0.948 g per person per day. The amount of calcium retained by four of the five subjects was fairly high and for all subjects averaged 0.046 g or 1 mg per kilogram of body weight, which represents 11 percent of the intake. With the exception of one subject who retained 0.099 g or 2.4 mg of phosphorus per kilogram of body weight, no significant retention of phosphorus was found.

Balance experiments on albino rats with fluorspar, R. G. Cheng and E. Reid (*Chin. Jour. Physiol., 12 (1937), No. 2, pp. 223–231*).—Fluorspar, which is widely distributed in Chekiang Province, was used as a source of calcium fluoride in a balance experiment divided into two periods conducted on rats receiving a diet consisting of one-third whole milk powder, two-thirds ground whole wheat, 5 percent dried blood, and common salt corresponding to 2 percent of the weight of the wheat. The calcium fluoride as fluorspar was given as supplement in amounts varying from 0.002 to 1.024 percent of the diet in the first period and from 0.000133 to 0.464 percent in the second period. The mean body fluorine content was determined on representative rats at the beginning and at intervals during the 6-mo. experimental period.

The presence of irregular boundaries between the dentine and predentine and of striations in the dentine appeared at all levels of fluorine above 0.058 percent after from 40 to 50 days, with bleaching observed first at the 0.004-percent level. From a comparison of the results with those reported by Smith and Leverton (E. S. R., 72, p. 878), it would appear that calcium fluoride in the form of fluorspar is about 40 times less toxic than the same amount of fluorine supplied as sodium fluoride.

After 4 mo. on the basal diet with minimal amounts of fluorine, approximately 100 percent of the total body fluorine was recovered and at the higher levels of intake about 90 percent as compared to approximately 60 percent at the end of 6 mo. The low percentage recovery of fluorine after the longer period of feeding suggests the possibility of several sources of error. Therefore, the authors do not consider the recovery figures obtained in this experiment to be significant.

The transference of ingested fluorine from parent to offspring, E. Reid and R. G. Cheng (*Chin. Jour. Physiol., 12 (1937), No. 2, pp. 233–237, fig. 1*).—In continuation of the study noted above, the authors determined the effect upon the growth and development of the young of feeding fluorine in the form of calcium fluoride and of a Chinese tea infusion to the mother rats. The fluorine content of the mother rats' diet ranged from 1.783 to 9.048 mg per 100 g. Some of the young rats were killed at birth and the remainder after from 2 to 3 weeks, and the bodies were analyzed for fluorine.

As the amount of fluorine in the mother's diet was increased, the amount of fluorine present in the young rats was also increased regardless of the source of the fluorine. Histological examination of the teeth of the young revealed characteristic changes which became more marked as the fluorine intake increased, although the gross appearance of the teeth was normal. It would appear that the fluorine ingested by the mother rats was transferred to the young through the placental membrane and through the milk secretion.

A comparison of the values obtained by calculation and by analysis for the iron content of 85 mixed diets, R. M. Leverton (*Jour. Amer. Dietet. Assoc., 13 (1937), No. 2, pp. 139–143*).—The data presented represent a portion of those collected in a study on the iron metabolism of four young women which was previously noted (E. S. R., 78, p. 568). The iron content of 85 5-day dietaries was calculated from the food tables given in Sherman's Chemistry of Food and Nutrition (E. S. R., 67, p. 768) and was compared with the values obtained by actual analysis, using the thiocyanate-amyl alcohol method and making triplicate determinations. For 81 dietaries the calculated values were found to be less than the determined values, the difference being less than 10 percent in 40.7 percent of the cases, between 10 and 20 percent in 33.3, betweent 20 and 30 percent in 16, and between 30 and 45 percent in 9.9 percent of the cases. "Variations in the iron content of food at different times, the liberal use of canned foods, and the practice of taking the samples of foods for analysis at the time of serving the meal after they had been prepared in the usual kitchen utensils, are believed to account for this difference."

The influence of sex on iron utilization in rats, M. S. Rose and H. J. Hubbell (*Jour. Nutr., 15 (1938), No. 1, pp. 91–102, fig. 1*).—Following the anemia production period during which the hemoglobin concentration was depleted to between 4 and 5 g per 100 cc of blood, young male and female rats were continued on the dried whole milk diet supplemented by 0.00038 mg of copper and iron in amounts adjusted to changing body weights in order to rule out the influence of the inherent sex difference in growth. Hemoglobin determinations were made on duplicate blood samples from the tail by the colorimetric method, using the Exton photoelectric scopometer. When the hemoglobin reached approximately 14 g per 100 cc of blood the animals were killed and their bodies analyzed for iron, and the sexes were compared as to the percentage of iron found. For definite proof that all of the reserve iron had been exhausted, copper supplements were administered to one group of rats during the anemia production period, and from the findings it was concluded that the administration of copper during the depletion period was not necessary.

Of the rats receiving 0.0019 mg of iron per gram of body weight, the males had an iron content of 0.03 ± 0.0003 mg and the females 0.034 ± 0.0005 mg per gram of body weight as compared to 0.034 ± 0.0006 and 0.038 ± 0.0007 mg, respectively, for those receiving 0.0038 mg of iron, and 0.033 and 0.037 mg, respectively, for the rats receiving 0.0057 mg of iron per gram of body weight. The results indicate that the females had an average storage of about 12 per-

cent more iron than the males when the intake was the same per gram of body weight.

The effect of bleeding ulcers and hemorrhagic anemia upon whole blood copper and iron, A. Sachs (*Amer. Jour. Digest. Diseases and Nutr., 4 (1938), No. 12, pp. 803, 804, figs. 2*).—In four cases of anemia in humans following massive hemorrhage from an ulcer, the author reports that the copper content of the blood rose as the iron and hemoglobin content decreased. This inverse ratio is also shown to be a very constant finding in induced hemorrhage in experimental dogs. The findings, together with those of a previous study (E. S. R., 74, p. 126), suggest that the copper is brought into use from the body stores to stimulate hematopoiesis.

Infections observed in experimental animals fed upon certain unbalanced diets, H. C. Hou (*Chin. Med. Jour., 53 (1938), No. 1, pp. 47–52*).—Following the method of assay described in a previous paper (E. S. R., 76, p. 422), the author studied the incidence of spontaneous infection as observed grossly and microscopically in 170 young rats maintained on six diets deficient in vitamin A and supplying no vitamin D, high vitamin D, no animal protein but containing soybeans, high protein and low starch, low protein and high starch, and low calcium and phosphorus, and on two diets containing normal amounts of the vitamins A and D, one free from animal protein and high in cereal and the other composed of soybeans, liver, millet, and cabbage.

When the diet was deficient in vitamin A the incidence of spontaneous infection tended to increase as the intake of vitamin D was raised. The incidence of the infection of the organs was not materially affected by the variations in the protein, starch, calcium, and phosphorus contents of the diets, but the group receiving the high protein and low starch diet had a high increase of skin infection which was not found in the other groups. The rats fed the high oat diet containing vitamins A and D had a life span four times longer than that of any other group, a relatively high incidence of infection, and a 100-percent incidence of taenia cysts in the liver as compared to less than 50 percent in the other groups.

The vitamin requirements of man, G. R. Cowgill (*Jour. Amer. Dietet. Assoc., 13 (1937), No. 3, pp. 195–214, fig. 1*).—In this review paper the author discusses the human requirements of the vitamins A, B (B_1), C, D, and G (B_2). The importance of an optimal rather than a minimal intake of these factors is stressed. The bibliography lists 30 references.

The calcium retention on a diet containing chlorophyll (A and B), C. R. Darby and M. G. Mallon (*Jour. Amer. Dietet. Assoc., 13 (1937), No. 1, pp. 26–33*).—In continuation of a previous investigation (E. S. R., 70, p. 717), two series of studies were carried out in which calcium balance determinations were made on seven healthy young women receiving a diet containing sufficient whole pasteurized milk to furnish the same high percentage of total calcium as was supplied by the lettuce in the previous study and supplemented by experimental chlorophyll extracted from dry stinging nettle leaves and from young leaves of spinach during the first 9-day period. During the second 9-day period the chlorophyll was omitted. Triplicate calcium determinations were made on the food, feces, and urine.

The results indicate that the addition of chlorophyll in peanut oil did not exert any favorable influence on the retention of calcium, with four subjects showing higher calcium balances when chlorophyll was not ingested, two subjects showing small positive balances for both periods, and one subject a higher calcium balance when chlorophyll was consumed in two out of three tests.

Effects of vitamin B (B_1) therapy on the polyneuritis of alcohol addicts, R. Goodhart and N. Jolliffe (*Jour. Amer. Med. Assoc., 110 (1938), No. 6, pp. 414–419*).—The results of a clinical investigation made on 17 alcohol addicts are presented to show that the primary cause of the polyneuritic condition incident to alcoholism is a vitamin B_1 deficiency and not the direct toxic action of the alcohol. The patients, all of whom had a mild polyneuritis, were maintained on an adequate diet containing 4 times the vitamin B_1 requirement of a 60-kg man and 8 of them were given daily intravenous injections of 10 mg of crystalline vitamin B_1 for 10 days. The response of these 8 subjects was much greater than that shown by the other 9 subjects, with the polyneuritis cured in 4 cases at the end of the 10-day period as compared to 1 in the latter group. The case histories of 4 of the subjects are presented.

The response of pellagrins to nicotinic acid, T. D. Spies (*Lancet [London], 1938, I, No. 5, pp. 252, 253*).—In a group of 15 persons with the characteristic pellagrous symptoms, as described in a previous study (E. S. R., 73, p. 283), 3 were given nicotinic acid parenterally in saline solution in divided doses totaling from 40 to 80 mg per day, and the remaining 12 were given nicotinic acid in aqueous solution orally in divided doses totaling from 200 to 1,500 mg per day. The response was studied by examination of the urine for the disappearance of porphyrinuria and by physical examination for the disappearance of the characteristic lesions of pellagra.

In the 12 cases the oral administration of nicotinic acid was "followed promptly by remission of the pellagrous glossitis, stomatitis, ptyalism, vaginitis, urethritis, and proctitis, and by disappearance of increased porphyrinuria." The author tentatively recommends 0.5 g of nicotinic acid per day, given in 5 doses of 100 mg each as a supplement to a well-balanced diet, as safe and effective for the usual case of pellagra. Remission of the pellagrous symptoms occurred in the 3 cases given the nicotinic acid by injection, but it is pointed out that it is rarely necessary to administer nicotinic acid parenterally.

The use of nicotinic acid in the treatment of pellagra, T. D. Spies, C. Cooper, and M. A. Blankenhorn (*Jour. Amer. Med. Assoc., 110 (1938), No. 9, pp. 622–627*).—In continuation of the above, the authors report the results of a clinical study conducted on two patients with endemic pellagra, three with alcoholic pellagra, and six with pellagra secondary to organic disease. Upon the administration of nicotinic acid orally to eight patients and by intravenous and parenteral injections to three patients, the mucous membrane lesions were cured and the pellagrous glossitis, stomatitis, ptyalism, vaginitis, urethritis, and proctitis disappeared. The nicotinic acid therapy was ineffective in severe cases of pellagrous dermatitis where the skin was broken and the lesions were moist, ulcerated, and thickened.

In a supplementary report the successful treatment of six additional cases of pellagra is noted. The administration of 500 mg nicotinic acid, nicotinic acid amide, and sodium nicotinate resulted in the healing of the mucous membrane lesions within from 24 to 48 hr.

The effect of vitamin B_1 on the peripheral neuritis of pellagra, T. D. Spies and C. D. Aring (*Jour. Amer. Med. Assoc., 110 (1938), No. 14, pp. 1081–1084*).—In continuation of the above, the authors observed the development of the clinical manifestations of peripheral neuritis in six cases of pellagra, four of which were associated with chronic alcohol addiction. The pellagra-producing diet was supplemented by crystalline vitamin B_1 given intravenously in three cases and by nicotinic acid given orally in the other three.

A prompt, dramatic response followed the injection of the vitamin B_1, which suggests the existence of a relationship between vitamin B_1 deficiency and the

peripheral neuritis associated with pellagra. The symptoms of stomatitis and glossitis were not alleviated by the vitamin B_1. In the patients receiving nicotinic acid but no vitamin B_1, the stomatitis and glossitis were relieved and the lesions of the mucous membrane healed but the peripheral neuritis was not cured. The case histories of two patients are presented.

Prevention by egg yolk of the dermatitis in chicks due to egg white, J. G. LEASE (*Poultry Sci., 16 (1937), No. 6, pp. 374–377*).—In continuation of previous studies (E. S. R., 78, p. 733), the author conducted an experiment on day-old chicks maintained on the rations described by Tully and Franke (E. S. R., 73, p. 91), with 3 percent raw, dried peanuts added to insure adequate vitamin B_4 and 5 percent egg white with 10, 55, and 110 percent yolk and 10 percent egg white with 20, 50, and 100 percent yolk substituted for the 15 percent whole egg. The symptoms of the pellagra-like syndrome were produced in the chicks on the 5 percent egg white with 10 percent yolk and 10 percent egg white with 20 percent yolk levels. On the 5 percent egg white with 55 percent yolk level no symptoms were present and growth was moderately good, and on the 110 percent yolk level the symptoms were absent and growth was excellent. On the 10 percent egg white with 50 percent yolk level slight symptoms were present and growth was moderate, and on the 100 percent yolk level there was excellent growth and no signs of dermatitis. It would appear that the chick requires about 5–10 times as much egg yolk as egg white in the ration to protect against egg white injury. "The difference between the response of the chick and the rat is due to the higher requirement of the chick for the protective factor in comparison with the rat rather than to any essential qualitative difference."

Distribution of vitamin C in Chinese foods.—I, Vegetables, H. C. HOU (*Chin. Jour. Physiol., 12 (1937), No. 2, pp. 249–262, figs. 4*).—Following the dye and iodine titration methods as described in a previous paper (E. S. R., 76, p. 279), the author investigated the distribution of vitamin C in different portions of a number of vegetables.

Among 22 vegetables the vitamin C content of the outer leaves was greater in 10 and less in 12 than the content of the inner leaves. In 12 out of 15 vegetables the leaves contained more vitamin C than did the stems, 1 showed similar values for both portions, and 2 contained more in the stems than in the leaves. The lamina contained more vitamin C than the petiole in 20 and less in 2 out of 22 vegetables tested. In 8 flowering vegetables 4 showed higher and 4 lower vitamin C values for the leaves than for the flowers.

Vitamin C in citrus-juice beverages and canned grapefruit juice, J. A. ROBERTS (*Food Res., 2 (1937), No. 4, pp. 331–337, figs. 6*).—The ascorbic acid content of eight dairy-type citrus beverages and four carbonated beverages containing the juices of orange, tangerine, grapefruit, and lemon and of one sample of orangeade was determined by the iodine method of Reynolds and Stevens which Mack et al. (E. S. R., 77, p. 425) had found to give more constant and easily reproducible results than the 2,6-dichlorophenolindophenol titration method. The bottled beverages sealed with metal or cardboard caps were also tested for total solids and citric acid, and after 7 days' storage at 7° C. the vitamin C determinations were repeated. The ascorbic acid content of 12 samples of canned grapefruit juice obtained from five different packers was determined monthly over a period of from 9 to 15 mo.

Omitting the orangeade, the total solids of the 12 beverages ranged from 10.4 to 15.8 percent, the citric acid from 0.1 to 1.03 percent, and the ratio of total solids: citric acid from 11 to 157. The ascorbic acid content varied from 3.42 to 38.2 mg per 100 cc, or 8.42 to 227 I. U. of vitamin C per ounce in the

dairy type beverages, the orangeade and two samples of the carbonated beverages contained no ascorbic acid and the other two contained 0.89 and 0.36 mg per 100 cc, or 5.28 and 2.14 units of vitamin C per ounce, respectively. After 7 days of storage the loss in ascorbic acid content varied from 7.3 to 69.1 percent and was greater than 18 percent in all but one of the eight beverages tested. The canned grapefruit juice, natural and sweetened, ranged from approximately 33 to 54 mg of vitamin C per 100 cc, and during the storage period the average loss was approximately 25 percent.

The ascorbic acid content of red cells and plasma, M. Pijoan and E. Eddy (*Jour. Lab. and Clin. Med., 22 (1937), No. 12, pp. 1227–1230, fig. 1*).—Blood samples from 12 normal individuals analyzed by the Pijoan and Klemperer modification of the Tillmans method, in which potassium cyanide is used to inhibit the catalysts, showed a range of ascorbic acid content in the plasma of from 1.31 to 2.8 and in the red cells of from 0.84 to 1.64 mg percent. The method is described in detail.

The determination and significance of vitamin C excretion in the urine [trans. title], K. Wachholder and P. Hamel (*Klin. Wchnschr., 16 (1937), No. 1, pp. 10–13*).—A comparison of the results obtained in the titration for vitamin C of 24-hr. samples of urine by the Tillmans 2,6-dichlorophenolindophenol method and the methylene blue method of Martini and Bonsignore (E. S. R., 73, p. 746) is reported, with the conclusion that, while both will detect a marked vitamin C deficiency, the methylene blue titration is more satisfactory for detecting a moderate degree of unsaturation and is to be preferred because of the greater stability of the reagent.

***Influence of infection on the vitamin C content of the tissues of animals*, L. J. Harris, R. Passmore, and W. Pagel** (*Lancet* [*London*], *1937, II, No. 4, pp. 183–186, figs. 3*).—In an effort to determine whether the decreased excretion of vitamin C in infective diseases involves an actual depletion of the vitamin from the body tissues, guinea pigs suffering from acute infection as a result of inoculation of *Bacterium aertrycke* or *Pasteurella pseudotuberculosis* or from the effects of diphtheria toxin were sacrificed and their adrenals and livers analyzed for vitamin C by the microtitration method of Birch, Harris, and Ray (E. S. R., 70, p. 741). As compared with normal controls receiving the same dietary intake of vitamin C, the infected animals had a much lower content of vitamin C in the adrenals but practically the same content in the liver. In a more chronic tuberculous infection there was a decrease in the amount in the adrenals and some decrease in the concentration of the vitamin in the liver.

Chemical determination of vitamin C deficiency as related to gingival disease, D. C. Lyons (*Jour. Amer. Dental Assoc. and Dental Cosmos, 25 (1938), No. 1, pp. 119–122*).—The method of determining the state of vitamin C deficiency of the human body by chemical determination of the vitamin C excreted in the urine was applied to a 24-year-old woman who had bleeding gums accompanied by some pain. Following an 8-day test period during which the daily vitamin C excretion was below 20 mg, the vitamin C content of the diet was increased to 250 mg by the addition of orange and lemon juice. At the end of 5 weeks the daily excretion of vitamin C was approximately 30 mg and the gums were restored to normal.

Vitamin C in heart failure, W. Evans (*Lancet* [*London*], *1938, I, No. 6, pp. 308, 309, fig. 1*).—The suggestion of Abbasy (E. S. R., 78, p. 572) that vitamin C may prove valuable as a mild diuretic was tested in comparison with other recognized diuretics in the treatment of eight cases of heart failure and one of edema of unknown etiology.

In two patients the increase in urinary excretion was slight, in four moderate or considerable, and in three marked following treatment by mouth with Redoxon in doses of three or six tablets daily. When measured in terms of the excess of urinary output over fluid intake in the nine patients over a period of 173 days, the diuresis induced by vitamin C was greater than that resulting from digitalis treatment, but less than from treatment with diuretin, theobromine, or ammonium chloride.

"These results, apportioning to vitamin C a diuretic property, direct attention to the need of providing an adequate supply of vitamin C for all patients with heart failure. In order to insure a constant state of vitamin C saturation in heart failure it is probably enough, if Redoxon is not administered, to include in the patient's diminished fluid intake an adequate proportion of lemon and orange juice."

Excretion of vitamin C in osteomyelitis, M. A. Abbasy, L. J. Harris, and N. Gray Hill (*Lancet [London], 1937, II, No. 4, pp. 177–180, figs. 5*).—This paper gives a graphic synopsis of the results of an earlier investigation of methods of determining vitamin C subnutrition by urine analysis (E. S. R., 74, p. 888), and reports the results of an extension of the series of studies on the effect of various infections on vitamin C excretion (E. S. R., 77, p. 731) to osteomyelitis in varying degrees. The subjects, who were all patients in the same children's hospital and received the same diet as those of the previous study, comprised 17 active, 17 half-healed, and 16 healed cases of osteomyelitis, and 10 controls with noninfective conditions, chiefly congenital deformity. The ascorbic acid excretion ranged from 9 to 15 mg per 10 stone (140 lb.) body weight per day for the active cases and from 20 to 40 mg for the healed cases and controls, with intermediate values for the half-healed cases. The controls and healed cases reacted well on the first day to the test dose of 700 mg per 10 stone body weight, while the active cases did not react until the second or third day.

Excretion of vitamin C in pulmonary tuberculosis and in rheumatoid arthritis, M. A. Abbasy, L. J. Harris, and P. Ellman (*Lancet [London], 1937, II, No. 4, pp. 181–183, figs. 3*).—In continuation of the series noted above, tests are reported for patients suffering from pulmonary tuberculosis and rheumatoid arthritis. Dietary conditions were first standardized by keeping all of the patients for about 4 weeks on a uniform diet supplemented with the juice of one orange daily, furnishing about 35 mg of ascorbic acid, this treatment having been found adequate to bring normal subjects into a state of vitamin C equilibrium.

In 13 subjects classed as active cases of pulmonary tuberculosis the excretion of vitamin C ranged from 5 to 13 mg per 10 stone (140 lb.) body weight, with an average of 7.6 mg, as compared with a range of from 18 to 28 mg and an average of 23 mg for 6 quiescent cases, intermediate values for 13 moderate cases, and values well above the standard for 8 controls, chiefly subjects with partially or nearly healed fractures. The active cases showed little response to the test dose even on the third day, the quiescent on the first day, and the moderate cases on the third day.

Similar methods were followed in a comparison of 25 cases of rheumatoid arthritis of varying degrees of severity with the same controls as in the tuberculosis study. The vitamin C excretion of all of the arthritis patients fell below the minimum standard of 13 mg per 10 stone body weight per day, the average being 8.6 mg. Most of the lowest excretions in the rheumatoid arthritis cases were among the older patients, and in the control cases also lower values were more commonly encountered in elderly than in young subjects. This observation is thought to support the contention of Gander and Niederberger (E. S. R., 78,

p. 137) that the need of vitamin C increases with age. The results obtained in the cases of tuberculosis studied confirm those of other investigators (E. S. R., 78, p. 731) in indicating an unusual wastage of vitamin C in this disease and the need of providing extra vitamin C to make up for the wastage. The results with rheumatoid arthritis are interpreted as likewise indicating an increased destruction of vitamin C in this disease.

"It is suggested that determination of the vitamin C excretion under controlled conditions may be of use as an index to confirm the presence of an infective state, and also as a prognostic guide to indicate the apparent activity of the disease."

Vitamin D precursors removed from human skin by washing, A. G. Helmer and C. H. Jansen (*Studies Inst. Divi Thomae, Athenaeum Ohio, 1 (1937), No. 2, pp. 207–216, pls. 11*).—In continuation of a previous study (E. S. R., 79, p. 139) the authors conducted a series of bio-assay tests in which rats maintained on the rachitogenic diet were given as supplement oily substances present in the secretion from human skin. In the first experiment the skin oil was obtained from 23 young men following 2 hr. of exercise by washing the upper part of the body with clean sterile washcloths moistened with clear water. The cloths and water were extracted three times with ether, and the extract was concentrated and irradiated by a quartz mercury arc before being fed to the test rats. In the second experiment 24 young men were exposed to irradiation from a quartz mercury arc just before the 2-hr. period of exercise, and the washings removed with clear water were bio-assayed. In another group of 24 young men who were irradiated, the washings were obtained with water and vitamin D-free soap, and in a third group not subjected to irradiation the washcloths and water were extracted and irradiated before being bio-assayed.

The results show that the oil removed by washing in clear water and irradiated possessed curative properties, with 90 percent of the rats having pronounced healing of the rachitic lesions. The rats receiving the oil removed from irradiated skin by clear water and by water and soap showed a slight to moderate degree of healing in about 95 percent of the cases, while of the animals receiving the oil removed from nonirradiated skin by water only 60 percent showed any healing of the lesions. It is concluded that the oil fractions removed from the human skin by washing contain an activatable factor which can be converted into an antirachitic agent by irradiation.

Foods suitable for fortification with vitamin D, C. F. Bing et al. (*Jour. Amer. Med. Assoc., 110 (1938), No. 7, p. 511*).—The Council on Foods of the American Medical Association issues a statement that in its report on milk as the most suitable carrier of vitamin D (E. S. R., 77, p. 890) the term "milk" includes those milk products used in the same manner and for the same general purpose as milk, such as evaporated, dried, and dried skim milk and flavored milk drinks prepared from whole or skim milk in which the volume of milk is at least 80 percent of the total volume. Suitable evidence regarding the quality of the product and the maintenance of its vitamin D potency is required by the council.

The blacktongue-preventive value of whole whey, delactosed whey, and American cheese, H. W. Sebrell, R. H. Onstott, and D. J. Hunt (*Pub. Health Rpts. [U. S.], 53 (1938), No. 3, pp. 72–83*).—This is another paper in a series of experimental studies (E. S. R., 77, p. 571) on the blacktongue-preventive values of various foodstuffs. Three groups of dogs maintained on the basic blacktongue-preventive diet No. 123 were given a 2.5-g supplement of whole whey powder which was increased to 7.5 g per kilogram of body weight when the symptoms of blacktongue developed, a 1-g supplement of delactosed whey powder which was increased to 3 g, and a 5-g supplement of American cheese which

was increased to 10 g per kilogram of body weight when the dogs showed the first signs of blacktongue. In the quantities given, the three foodstuffs proved to be poor sources of the blacktongue-preventive factor.

Riboflavin deficiency in dogs, W. H. SEBRELL and R. H. ONSTOTT (*Pub. Health Rpts. [U. S.]. 53 (1938), No. 3, pp. 83–94*).—In continuation of previous studies (E. S. R., 77, p. 571), the authors present the results of a study in which five dogs receiving the blacktongue-preventive diet No. 465 containing an adequate amount of vitamin B_1 developed the symptoms of "riboflavine deficiency" or "yellow liver" in 140, 121, 118, 369, and 125 days, respectively, from the beginning of the experiment. When from 1 to 5 mg of riboflavine (L. F. 356) were administered by intramuscular and intraperitoneal injection during the early attacks, the dogs responded and the condition was alleviated. The characteristics of the deficiency are described as bradycardia, cardiac arrhythmia, collapse, and coma, followed by death. The necropsy findings include a yellow mottling of the liver and degenerative changes in the central nervous system.

TEXTILES AND CLOTHING

Tests for the physical properties of textile fabrics, E. L. PHELPS. (Minn. Expt. Sta.). (*A. S. T. M. [Amer. Soc. Testing Materials] Bul. 90 (1938), pp. 11–13; also in Canad. Chem. and Process Indus., 22 (1938), No. 2, pp. 38–40*).—The author discusses the methods of sampling, the equipment and the test procedures followed in the measurement of the physical properties of fabrics, and the interpretation of the data.

Oxidative degradation of silk, II, M. LICHTE and R. EDGAR. (Iowa Expt. Sta.). (*Iowa State Col. Jour. Sci., 12 (1937), No. 1, pp. 1–4*).—In the second part of this study (E. S. R., 77, p. 284), the authors present quantitative data of the effect of different concentrations of potassium permanganate, 0.06 M as to sulfuric acid, at 40° C. for 10 hr. on the weight, ash, nitrogen, and wet strength of plain woven fabrics of wild silk fibroin, silk fibroin, and lead-weighted silk, and the wet strength of plain woven iron-, tin-, tin-and-lead-, and zinc-weighted silks of typical commercial quality. The results are compared with those obtained in the first part of the investigation on the effect of aqueous potassium permangante.

For the removal of stains from silk fabrics, acidic solutions of potassium permanganate are preferable, since "all the silks but the lead-weighted retained measurable wet strengths at concentrations double those at which their lowest strengths occurred in aqueous permanganate." The smallest loss of wet strength occurred in the wild silk fibroin, followed in order by the silk fibroin, iron-, zinc-, tin-, and tin-and-lead-weighted silk crepes. The losses of nitrogen and weight were the same for the wild silk fibroin and the silk fibroin and were less than those of the lead-weighted silk. The ash losses increased with increasing concentration of the permanganate.

HOME MANAGEMENT AND EQUIPMENT

The utilization of bamboo in the construction of equipment for farm homes and dwellings [trans. title], A. LEE. (P. R. Expt. Sta.). (*Rev. Agr. Puerto Rico, 28 (1937), No. 4, pp. 640–646, figs. 3*).—Experimental work on the use of bamboo for the construction of essential household articles and equipment is briefly described.

Factors in the economical operation of an electric refrigerator, V. E. SATER. (State Col. Wash.). (*Jour. Home Econ., 30 (1938), No. 2, pp. 111–*

113).—Tests were made to determine the effect upon the power consumption of opening the door of an electric refrigerator at various intervals and for varying lengths of time and of freezing desserts and ice cubes. The two test refrigerators were placed 12 in. from an inside wall in a room kept at from 70° to 72° F.

When the refrigerator was kept closed the amount of power required to maintain the interior temperature was 0.04 kw.-hr. and the proportion of the total period during which the motor ran was 17.1 percent. When the door was opened at 15-min. intervals for 2 min. the power consumption increased to 0.058 kw.-hr. and the running time of the motor to 27.8 percent. When the door was opened at 15-min. intervals for 30 sec. and 1 min., at 30-min. intervals for 2 min., and at 1-hr. intervals for 4 min., the power consumption was 0.048 kw.-hr. 0.053, 0.055, and 0.055 kw.-hr., respectively, and the running time of the motor 21.1 percent, 24.2, 23.9, and 23.7 percent, respectively. Varying the length of time the door was kept open caused more change in the running time of the motor and the power used than did variations in the frequency of opening the door.

In the freezing tests, making ice cubes required 2.29 hr. and a power consumption of 0.242 kw.-hr. during the total freezing period, grape ice 2.5 hr. and 0.238 kw.-hr. of electricity, ice cream 2.71 hr. and 0.211 kw.-hr., pineapple mousse 2.35 hr. and 0.188 kw.-hr., and maple parfait 1.6 hr. freezing time and 0.139 kw.-hr. of electricity, or an additional 0.116, 0.101, 0.062, 0.059, and 0.051 kw.-hr., respectively, was required to maintain the interior temperature at about 26° than when the refrigerator was empty. More electricity was required to freeze water for ice cubes than to freeze desserts, and less current was needed for the frozen desserts made with whipped cream and evaporated milk than for the water ices.

MISCELLANEOUS

Sixtieth Report of the Connecticut Agricultural Experiment Station, New Haven, for the year 1936, W. L. Slate et al. (*Connecticut [New Haven] Sta. Rpt. 1936, pp. [982], pls. 11, figs. 133*).—In addition to the usual administrative data, this report contains reprints of Bulletins 390–403, all of which have been noted previously, and the following circulars: Nos. 117, Growing Seedlings in Sand, by A. A. Dunlap (pp. 1–12), and 118, Insecticides to Control the European Corn Borer, by N. Turner (pp. 13–16).

Forty-eighth Annual Report of the Storrs Agricultural Experiment Station, Storrs, Connecticut, for the year ending June 30, 1936, W. L. Slate et al. (*[Connecticut] Storrs Sta. Rpt. 1936, pp. [426], figs. 83*).—This includes reprints of Bulletins 214–219, previously noted, and of Bulletin 220, abstracted on page 246 of this issue.

Information regarding recent publications (*Kansas Sta. Circ. 189 (1938), pp. 4*).—This circular briefly describes Bulletins 275 and 276 and Circulars 180, 181, and 183–188, all previously noted.

The Colonial Agricultural Service list (*London: Colon. Off. 1937, pp. XII+63*).—This list enumerates the offices in the various units of the British Colonial Service and gives brief biographical notes as to the incumbents as of November 30, 1936.

Bibliography of tropical agriculture, 1936 (*Roma: Internatl. Inst. Agr., 1937, pp. VII+326*).—Continuing the series (E. S. R., 77, p. 286), this classified bibliography deals with the year 1936. Annotations in English and French are given.

Elements of statistical method, A. E. Waugh (*New York and London: McGraw-Hill Book Co., 1938, pp. XV+381, figs. [58]*).—A textbook giving the principles and procedure for statistical analyses.

NOTES

Alaska University.—Under an act of Congress signed by President Franklin D. Roosevelt on May 17, a tract of about 37 acres situated in the Tongass National Forest near Petersburg has been conveyed to the university for use as a fur farm experiment station.

Hawaii Station.—Dr. O. C. Magistad, director since 1935, has resigned to become director of the new U. S. D. A. Regional Research Laboratory on Salinity, which has been located at Riverside, Calif. L. A. Henke, assistant director, has been appointed acting director.

Minnesota University and Station.—Announcement is made of the retirement on June 30 of William Boss, chief of the division of agricultural engineering since 1918, thus ending a period of service beginning in 1892 as instructor in carpentry and steam engineering. During this period the division has developed from a simple course in manual training to a highly diversified study of farm structures, farm power, and farm engineering practice.

New York State Station.—Dr. Hugh Glasgow, chief in research (entomology), has succeeded Director P. J. Parrott as chief of the division of entomology, effective July 1.

Cornell University and Station.—Dr. George F. Warren, widely known as a pioneer in the field of farm management and for his contributions to economic theory on prices and production, died May 24 at the age of 64 years. A native of Nebraska, he was graduated from the University of Nebraska in 1897. After a period of teaching he entered Cornell, receiving the B. S. A. degree in 1903, the M. S. A. degree in 1904, and the Ph. D. degree in 1905. A year at the New Jersey Stations as assistant horticulturist was followed by his return to Cornell as assistant professor of agronomy. In 1907 he became assistant professor of farm crops, in 1909 professor of farm crops and farm management, and in 1911 professor of farm management, while since 1919 he had been professor of agricultural economics and farm management. He was prominent in the organization of American Farm Management Association, now the American Farm Economic Association, serving as its second president in 1913. He was also the author of an important series of memoirs on agricultural prices and related topics, as well as several well-known treatises, including Elements of Agriculture (1909), Farm Management (1913), Laboratory Exercises in Farm Management (1916), and (with F. A. Pearson) The Agricultural Situation (1924).

Dr. Beverly T. Galloway, dean of the College of Agriculture and director of the station from 1914 to 1916, but more widely known for his long and outstanding service with the U. S. Department of Agriculture, died in Washington, D. C., on June 13 at the age of 74 years. A native of Missouri, he received the degree of bachelor of agricultural science from the University of Missouri in 1884 (and the LL. D. degree in 1902), and was assistant in horticulture from 1884 to 1886. His initial appointment with the U. S. Department of Agriculture was as assistant pathologist in 1887. Later he served as pathologist until 1900, as Chief of the Bureau of Plant Industry until 1912, as Assistant Secretary of Agriculture from 1913 to 1914, again as pathologist in the Office of Foreign Plant Introduction from 1916 until his retirement in 1933, and subsequently as collaborator.

Rhode Island College and Station.—George E. Adams, associated with the institution as student, horticulturist, and in other capacities since 1891 and dean of the College of Agriculture, director of extension, and director of the station since 1933, retired August 1. He is succeeded by Dr. Paul S. Burgess, previously dean and director in the Arizona University and Station.

Regional Poultry Research Laboratory.—This laboratory has been located at East Lansing, Mich., where a site of 50 acres has been deeded to the United States by the Michigan State College of Agriculture. Contracts have been let for a central laboratory building, two large brooder houses, and two smaller buildings for special disease studies, and it is hoped to have these structures ready for occupancy by January 1, 1939. Special attention will be given at the outset to studies of fowl paralysis. Twenty-five States, including all in the region north of the Ohio and east of the Mississippi Rivers and in addition West Virginia, Minnesota, Iowa, Missouri, Oklahoma, Kansas, Nebraska, and North and South Dakota, are cooperating with the U. S. Department of Agriculture in the project.

New Journals.—*The Journal of Documentary Reproduction* is "a quarterly review of the application of photography and allied technics to library, museum, and archival service," published at 520 North Michigan Avenue, Chicago, Ill., by the American Library Association. Among the features of the initial number is the first installment of a Selected Bibliography on Photographic Methods of Documentary Reproduction (pp. 87–123).

Inhisarlar Tütün Institusu Raporlari (Reports of the Tobacco Institute of Turkey) is being published from time to time at Istanbul (Constantinople), Turkey. The initial number contains articles in the Turkish language, but with French or German summaries, as follows: A Glimpse of the Program of Tobacco Selection, by Z. Akkoyunlu (pp. 15–22); The Chemical Composition and Qualities of Turkish Tobaccos, by A. Rieser (pp. 23–47); and Plant Diseases in Our Tobacco Culture, by K. Tomur (pp. 48–54).

Radiophonic Rurale is being issued at Roma by the International Federation of Agronomic Technicians as a supplement to *La Technique Agricole Internationale*. The initial number is devoted mainly to a discussion of the work of the International Center of Rural Broadcasting, including the status of rural broadcasting in various countries. The articles are mainly in French, but those on the United States, contributed by M. Salisbury, and Japan (by S. Komori) are in English.

Virginia Wildlife is being published monthly by the Virginia Wildlife Federation as the beginning of an educational program sponsored by the federation and the Virginia Commission of Game and Inland Fisheries. The initial number contains Research Units Find Facts for Wildlife Management (pp. 1, 6) and A Wildlife Program for Public Schools (p. 4).

Journal of Milk Technology is being published bimonthly by the International Association of Milk Sanitarians at 17–19 Day Street, Orange, N. J., replacing the yearbook hitherto issued. The initial number deals mainly with the proceedings of the twenty-sixth annual meeting of the association, held at Louisville, Ky., Oct. 11–13, 1937.

Records of the Malaria Survey of India has been rechristened *Journal of the Malaria Institute of India*.

EXPERIMENT STATION RECORD

Vol. 79 October 1938 No. 4

THE DEPARTMENT OF AGRICULTURE APPROPRIATION ACT, 1939

Appropriations made in the act for the support of the Federal Department of Agriculture for the fiscal year ending June 30, 1939, as signed by President Franklin D. Roosevelt on June 16, 1938, aggregate $742,040,279, plus $187,105,000 of reappropriated funds. If to this are added $152,023,958 for the so-called "permanent" appropriations, which automatically become available, $825,000 carried in the Second Deficiency Act, $7,000,000 transferred from the War Department for flood control surveys, and $387,000,000 available under the Work Relief and Public Works Appropriation Act of 1938, the total for the year becomes $1,475,994,237. The comparable aggregate for the preceding year, including deficiency appropriations, was $984,005,456, of which $850,794,177 was derived from the appropriation act.

By far the largest allotment is that for the conservation and use of agricultural land resources. The act itself appropriates $345,000,000 and reappropriates $155,000,000, while $356,024,893 additional will be available from other sources for parity payments to producers of wheat, corn, cotton, rice, and tobacco and for other price adjustments. Second in size only to these appropriations are the grants for roads. The Bureau of Public Roads receives $187,500,000, an increase of $20,000,000, mainly for more rapid elimination of grade crossings and the construction of Federal-aid feeder roads, and in addition $14,000,000, an increase from $12,500,000, is made available for forest roads and trails. A third major allotment is that of $175,000,000 to the Farm Security Administration for loans, relief, and rural rehabilitation.

Other large items relate to the carrying into effect of recent legislation, such as the Sugar Act of 1937, for which $48,000,000 is provided, and the Farm Tenant Act, with $25,000,000 for loans to farm tenants, $2,000,000 for the liquidation and management of resettlement projects, and $5,000,000 for land utilization and the retirement of submarginal land. A reappropriation of $25,500,000 is made under the Federal Crop Insurance Act of 1938; $1,800,000 is granted for the retirement of cotton pool participation trust certificates; and $500,000 is allocated to develop facilities for water storage and utilization.

The special research fund of the Department under the Bankhead-Jones Act (E. S. R., 73, p. 289) is increased from $1,200,000 to $1,400,000. Authorization is also given to utilize not to exceed $100,000 of funds available under the Agricultural Adjustment Act of 1938 to conduct a survey to determine the location of the regional research laboratories provided under that act (E. S. R., 78, p. 437) and the scope of the investigations to be made, and to coordinate the research work now being carried on.

For what are termed the "ordinary activities" of the Department the allotment is $93,747,611, a decrease from $99,314,204. The largest item under this heading is that for the Soil Conservation Service, which shows an apparent decrease from $24,390,780 to $23,525,000. Of this amount $425,135 represents transfers to other bureaus of the Department, and the remainder is a curtailment for operations, demonstrations, and information. The allotment for soil and moisture conservation and land-use investigations is $1,510,601.

A total of $19,560,400 is provided for the Forest Service. Its net increase of $668,218 is largely in the funds for administration of the national forests and for increased cooperation in forest fire control, farm forestry, and private forestry.

An apparent increase from $10,373,098 to $14,136,731 for the Bureau of Animal Industry is more than offset by a reduction from $15 864,000 to $6,600,000 in the funds reappropriated for the campaign against tuberculosis and Bang's disease, making the new total for this purpose $12,003,000. The remaining allotments of the Bureau are continued without substantial change.

The funds administered by the Extension Service are increased from $17,490 083 to $17,917,583. The full authorized increase of $1,000,000 in Bankhead-Jones funds is provided, but $645,000 has again been deducted from certain supplementary funds hitherto available under a sliding-scale arrangement looking toward their complete replacement by Bankhead-Jones funds in 1940. An increase of $3,000 is made for extension work in Alaska, raising the total to $21,418, while $45,000 is allotted to extend the Bankhead-Jones Act to Puerto Rico.

Under the Office of Experiment Stations a total of $6,770,230 is provided, of which $6,541,250 represents payments to the States, Hawaii, Alaska, and Puerto Rico for agricultural experiment stations, including $720,000 each under the Hatch and Adams Acts, $2,880,000 under the Purnell Act, $2,100,000 under the Bankhead-Jones Act, and a total of $121,250 under supplementary legislation (of which Hawaii receives $55,000, Alaska $23,750, and Puerto Rico $42,500). This is an increase of $308,750 over the previous year, of which $300,000 is under the Bankhead-Jones appropriations. For the administrative expenses of the Office itself, $161,735 will again be available, while the supplementary administrative allotment of 2 percent of the special research

fund of the Department under the Bankhead-Jones Act automatically increases from $24,000 to $28,000. In addition $67,245 will be available for the maintenance of the Federal Experiment Station in Puerto Rico, but in Hawaii participation by the Office in the management of the station maintained in recent years jointly with the University of Hawaii is terminated as planned as of July 1, 1938.

The allotments for the Bureau of Agricultural Economics show a total of $6,566,483 and a net increase of $353,785. The items of increase include $225,483 to carry into effect the provisions of an act approved April 13, 1937, for classification and information service in communities organized for cotton quality improvement; $90,000 and $65,000, respectively, to strengthen the enforcement of the Tobacco Inspection and Warehouse Acts; $45,302 to extend the market news service; and $23,500 for additional market inspection of farm products. Offsetting them in part are decreases of $30,000 for studies of farm management and practice, $35,000 for studies in marketing and distributing farm products, $15,000 for crop and livestock estimates, $3,000 for studies of foreign competition and demand, and $10,000 under the Cotton Futures and Standards Act.

The funds provided for the Bureau of Entomology and Plant Quarantine are decreased from $5,711,398 to $5,701,867, but $700,000 additional is made available in the Second Deficiency Act for the control of grasshoppers and other pests and $10,000 for the use of the Mediterranean Fruit Fly Board. Increases are made in the allotments from $296,800 to $446,800 for Thurberia weevil control, from $381,580 to $461,580 for truck crop and garden insects in order to construct a tobacco laboratory at Oxford, N. C., and from $182,600 to $191,000 for insects affecting man and animals. The decreases are distributed among seven projects, the largest being the control of screwworms, Japanese beetles, and gypsy and browntail moths, the insecticide and fungicide investigations, and the insect pest survey.

The total for the Bureau of Plant Industry shows a decrease from $4,909,048 to $4,741,675, distributed among 12 items, the largest reductions being $106,200 for sugar plant investigations, $67,413 for the National Arboretum, and $64,750 for the studies of dry-land agriculture. These are offset in part by an increase of $119,700 for studies with fruit and vegetable crops, particularly tung-oil investigations. The latter will be supplemented by chemical studies under an allotment of $30,000 to the Bureau of Chemistry and Soils. This Bureau is also given an increase of $39,957 for work in the industrial utilization of farm products and byproducts, especially sweetpotato drying and citrus byproducts. Despite slight reductions on its other projects, the total for the Bureau of Chemistry and Soils rises from $1,425,431 to $1,457,508.

The Bureau of Biological Survey is granted an allotment of $1,000,000 under a 1937 act for Federal aid to the States in wildlife restoration projects, as well as $25,000 additional for the development of fur resources investigations. Its total appropriation is increased from $2,127,840 to $3,248,340.

The remaining work of the Department is provided for much as at present. The Weather Bureau receives $4,987,870, a net increase of $284,821, available entirely for additional aerological work; the Bureau of Dairy Industry $717,405, an increase of $13,711 for investigations; the Bureau of Home Economics $305,085, an increase of $60,000 to be divided equally between investigations of family economics and cotton hosiery; the Commodity Exchange Administration $635,000, an increase of $135,000; and the Bureau of Agricultural Engineering $510,000, an increase of $49,231. An apparent increase of $220,640 to the Office of Information raises its total to $1,474,770, but it is made up entirely of transfers from the Soil Conservation Service and provides no additional funds. The Food and Drug Administration again receives $2,227,758, the Library $105,420, and the Beltsville Research Center $85,000 (an increase of $10,000).

APPOINTMENT OF ASSISTANT CHIEF, OFFICE OF EXPERIMENT STATIONS

Effective August 16, 1938, the position of assistant chief has been established in the Office of Experiment Stations. This action is taken as a result of the broadening and intensification of the responsibilities of the Office within the past few years. The primary duties are announced as, in association with the chief, to "direct and supervise the administration of the Federal Acts granting funds to the States for research with all correlated responsibilities and to assume leadership in the maintenance of desirable research relationships between States and between State and Federal agencies with respect to these Federal-grant Acts." R. W. Trullinger, principal experiment station administrator and agricultural engineer, who has been associated with the Office since 1912 has been appointed to the position.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

[**Biochemical researches of the New Haven Station**] (*Connecticut* [*New Haven*] *Sta. Bul. 409* (*1938*), *pp. 281–283*).—This report contains a very brief summary of work in part previously reported (E. S. R., 78, p. 293; 79, p. 149), together with notes on the chemistry of rhubarb, composition of zein, and the nature of beet pigment.

[**Chemical investigations by the Washington Station**]. (Partly coop. U. S. D. A.). (*Washington Sta. Bul. 354* (*1937*), *pp. 79–81*).—The report notes work by H. H. Mottern, O. Johnson, and P. D. Isham on concentrated apple juice, clarification of apple juice, and apple sirup; and on soft fruit products utilization, and vegetable juice investigations, both by Isham and Mottern.

Some wax-like constituents from expressed oil from the peel of Florida grapefruit, Citrus grandis, K. S. Markley, E. K. Nelson, and M. S. Sherman. (U. S. D. A.). (*Jour. Biol. Chem.*, *118* (*1937*), *No. 2*, *pp. 433–441*).—From the nonvolatile waxy residue remaining after distillation of Florida grapefruit peel oil the following constituents have been identified: Solid fatty acids of mean molecular weight corresponding to $C_{32}H_{64}O_2$; linolenic, linoleic, and oleic acids; a sapogenic ketone, $C_{30}H_{52}CO$; hydrocarbons, $C_{29}H_{60}$ and $C_{31}H_{64}$; a phytosterol, $C_{28}H_{47}OH$; and umbelliferone, $C_9H_6O_3$. The nature of the constituents comprising the nonvolatile residue of grapefruit peel oil indicated that they have their origin in the cuticle wax of the fruit which is dissolved by the oil during the pressing.

The wax-like constituents of the cuticle of the cherry, Prunus avium, L., K. S. Markley and C. E. Sando. (U. S. D. A.). (*Jour. Biol. Chem.*, *119* (*1937*), *No. 2*, *pp. 641–645*).—The skins of Bing cherries (*P. avium*) have been examined with respect to the constituents soluble in petroleum ether and ethyl ether. From the petroleum ether extract there were isolated or identified solid fatty acids consisting of a ternary mixture of palmitic, stearic, and a small amount of acid higher than C_{18}; the liquid fatty acids, linoleic and oleic acids; a small amount of glycerol; and a hydrocarbon fraction consisting predominantly of nonacosane, admixed with a hydrocarbon of greater chain length. The ether extract yielded *d*-glucosidylsitosterol and ursolic acid. The yields of the petroleum ether and ethyl ether extracts amounted to 0.8 percent and 0.1 percent, respectively, of the dried skins. A comparison of these figures with the corresponding percentage yields from apple and pear cuticles indicates a possible explanation for the less efficient protective surface coating of the cherry.

A method for extracting growth substances from pigmented tissues, H. G. DuBuy. (Md. Expt. Sta.). (*Jour. Agr. Res.* [*U. S.*], *56* (*1938*), *No. 2*, *pp. 155–158*, *fig. 1*).—An improved method for extracting growth regulators from pigmented plants is described. The material is frozen by grinding it with solid carbon dioxide; a water extraction is made at 0° C.; and the growth regulators are then concentrated from chloroform or ether extracts, are trans-

ferred in 2 percent agar, and are prepared for testing by means of a special agar divider which cuts the 0.2 cc agar mass into 25 equal blocks of 8 mm^3, providing enough material for 2 series of 12 plants each, with practically no loss of growth substance.

Factors influencing the destruction of glucose and fructose by oxygen, M. Clinton, Jr., and R. S. Hubbard (*Jour. Biol. Chem., 119 (1937), No. 2, pp. 467–472*).—The interconversion of dilute buffered carbohydrate solutions and the oxidation of fructose by oxygen gas were found to be independent phenomena, separable from one another under carefully controlled conditions. The oxidation took place in the presence of phosphate and arsenate solutions, but not in the other buffer systems studied. The authors consider that the oxidation may be brought about by the catalytic action of traces of impurities in the phosphate and arsenate used. Glucose, treated similarly, was not destroyed under conditions which showed up to 40 percent destruction of fructose in 6 hr.

A method for the isolation of glucosamine, E. Chargaff and M. Bovarnick (*Jour. Biol. Chem., 118 (1937), No. 2, pp. 421–426*).—The authors separated glucosamine from its mixtures with simple sugars and amino acids by means of its carbobenzoxy derivative. The compound crystallized from 30 percent methyl alcohol white lancet-shaped needles which melted with decomposition at 214° C. (corrected). "The substance is dextrorotatory and shows marked mutarotation with a final $[\alpha]_D^{24} = +75.4°$ (in pyridine). It reduces Fehling's solution and gives a negative ninhydrin reaction. It is soluble in glacial acetic acid and pyridine, in hot alcohol, and hot acetone, very slightly soluble in hot water; insoluble in benzene, chloroform, ethyl acetate. At 25°, 0.57 g of the compound is soluble in 100 cc of water."

Detection and quantitative determination of small amounts of glucose in mixtures containing maltose, M. Somogyi (*Jour. Biol. Chem., 119 (1937), No. 2, pp. 741–747; abs. in Chem. Abs., 31 (1937), No. 20, pp. 7361, 7362*).—A method based on differences in fermentation is described.

The colorimetric determination of lactic acid in fruits and fruit products, F. Hillig. (U. S. D. A.). (*Jour. Assoc. Off. Agr. Chem., 20 (1937), No. 4, pp. 605–610*).—The author reports two modifications of his colorimetric method based on the reaction of lactic acid with ferric chloride (E. S. R., 78, p. 299), one of these procedures adapting the method to use with jams and jellies, the other to the examination of wines. Difficult manipulations are avoided, and "the determination can be completed easily in a working day."

The separation of choline and ethanolamine, E. Chargaff (*Jour. Biol. Chem., 118 (1937), No. 2, pp. 417–419*).—The author has found an excellent reagent for the separation of choline from substances containing free amino groups in carbobenzoxy chloride, $C_6H_5CH_2OCOCl$. Whereas choline does not react with the reagent, a crystalline carbobenzoxy derivative of ethanolamine is formed in good yield from which the free base can be easily recovered. The advantages of this method are its rapidity, the formation of derivatives of definite melting point, and the ease with which recovery of the free bases can be effected.

Chemical studies on the neuroproteins.—I, The amino acid composition of various mammalian brain proteins, R. J. Block (*Jour. Biol. Chem., 119 (1937), No. 2, pp. 765–768*).—Proteins were prepared from human, monkey, beef, sheep, rat, and guinea pig brains and analyzed, the following average values being obtained: Nitrogen, 13.6 percent, histidine, 2.4, lysine, 4.3, arginine, 5.1, cystine, 1.4, tryptophane, 1.2, and tyrosine, 3.9 percent. The results indicate that all six brain proteins contain approximately the same relative proportions

of these amino acids, although they may vary in absolute amounts. Attention is called to the remarkable constancy of the molecular ratio of lysine to arginine in four of the proteins analyzed and to the somewhat lower ratios found in the human and monkey brain proteins.

A stable metaphosphate preparation for use as a protein precipitant, D. R. Briggs. (Minn. Expt. Sta.). (*Soc. Expt. Biol. and Med. Proc., 37 (1938), No. 4, pp. 634–638*).—Although metaphosphoric acid effects essentially quantitative precipitation of proteins in pH ranges acid to the isoelectric point of the protein, because of its instability in aqueous solution and to the difficulty of obtaining a uniform commercial reagent it "has lost favor as a standard protein precipitant, although its action closely simulates that of the more expensive trichloroacetic acid commonly used (in 10 percent solution)." By heating sodium dihydrogen *o*-phosphate monohydrate to 400° C. the author obtained an amorphous white powder of the formula $(NaPO_3)_X$; and by further heating to 700°, a fusion yielding a vitreous solid on cooling. "Solutions of this [the vitreous] form of metaphosphate have a greater power to precipitate protein (do so in lower concentrations) than do those obtained from the amorphous powder prepared at 400°. Conductivity-concentration curves and freezing point depressions measurements made with solutions of these two forms of Na metaphosphate show that the white powdery Na metaphosphate acts as a unitrivalent strong electrolyte, having a formula $Na_3(PO_3)_3$, while the glass form acts as a weak electrolyte so highly polymerized that, except at very high dilutions, only a part of the Na is ionized. The valence of the complex polymerized ion is much higher than 3. . . .

"Both of these forms are relatively stable in water solution and retain their power to precipitate protein (in acid solution) over a period of months after standing at room temperature. However, hydrolysis occurs slowly and it is possible that depolymerization proceeds also over that period of time. . . . Due, perhaps, to traces of NaH_2PO_4 which will remain even after long periods of heating the melted salt, the pH of aqueous solutions of these preparations of Na metaphosphate is of the order of 5.5. If a small amount of Na_2CO_3 or NaOH is added to the solutions of these salts, bringing the pH to 8 or 9, the stability of the metaphosphate at ordinary temperatures is practically permanent."

The precipitation of the proteins in milk.—I, Casein. II, Total proteins, III, Globulin. IV, Albumin and proteose-peptone, S. J. Rowland (*Jour. Dairy Res. [London], 9 (1938), No. 1, pp. 30–41, fig. 1*).—Methods for the separation of the total proteins, casein, globulin, albumin, and proteose-peptone substances of milk (E. S. R., 77, p. 385) are described. The use of a rather high concentration of trichloroacetic acid, i. e., 1 volume of milk to 5 volumes of 15-percent trichloroacetic acid, is recommended for the precipitation of proteins in the determination of the total and nonprotein nitrogen of milk. Diluting 1 part of milk with 8 parts of water, adding an appropriate amount of 10-percent acetic acid, followed by the addition of a normal sodium acetate solution gave maximum precipitation of casein. The precipitation of globulin, uncontaminated by either albumin or casein, was accomplished by treating casein-free filtrate, adjusted to approximate neutrality, with crystalline magnesium sulfate. Albumin and proteose peptone can be readily determined as the difference between the soluble protein and the globulin. Two methods are suggested for the separation of albumin from the proteose-peptone fraction.

The determination of the nitrogen distribution in milk, S. J. Rowland (*Jour. Dairy Res. [London], 9 (1938), No. 1, pp. 42–46*).—Utilizing the method

of separation described above, a semimicro Kjeldahl method for the quantitative determination of the various nitrogen fractions in milk is described.

The estimation of cystine in finger nail clippings with hydrolysis for one hour, M. X. Sullivan, H. W. Howard, and W. C. Hess (*Jour. Biol. Chem., 119 (1937), No. 2, pp. 721–724*).—The authors find that when time saving is of importance hydrolysis may be completed in 1 hr. by the use of 15 N sulfuric acid at 150° C., this hydrolysis being followed by decolorization with a small quantity of acid-washed decolorizing carbon ("carbex E"). This procedure is considered, however, to be less satisfactory for general work than is the longer hydrolysis treatment with hydrochloric acid (E. S. R., 70, p. 444).

A simple method for the determination of acetone in blood and urine, J. C. Abels (*Jour. Biol. Chem., 119 (1937), No. 2, pp. 663–667; abs. in Chem. Abs., 31 (1937), No. 21, pp. 7921, 7922*).—By a turbidimetric procedure based on a precipitation by Nessler's solution, the author is able to determine as little as 0.002 mg of acetone in a 0.5-cc sample.

The microdetermination of chlorides in biological materials: Presentation of a method and an analysis of its use, A. Keys (*Jour. Biol. Chem., 119 (1937), No. 2, pp. 389–403, figs. 4*).—The method described is applicable for the accurate determination of the chloride content of 0.2-cc samples. The samples are digested with nitric acid, an exactly measured excess of 0.2 N silver nitrate solution, and hydrogen peroxide; the oxidation being complete in from 30 min. to about 1 hr. A thiocyanate titration is carried out in the presence of a layer of chloride-free ether after centrifuging to settle the silver chloride precipitate. In the presence of the ether the silver thiocyanate precipitate collects at the interface between the ether and the aqueous solution, so that the titration field is kept clear and back reactions are reduced to a minimum.

The determination of ascorbic acid in blood, A. Emmerie and M. van Eekelen (*Biochem. Jour., 31 (1937), No. 11, pp. 2125–2127*).—The authors review their method for whole blood (E. S. R., 76, p. 155), and report a comparison of the results obtained on the same extracts of whole human blood by their method, involving precipitation of interfering sulfur compounds by mercuric acetate, and the methylene blue method of Martini and Bonsignore (E. S. R., 73, p. 746). "The same values having been found, we may conclude that all the interfering substances which reduce 2,6-dichlorophenolindophenol and which do not reduce methylene blue are removed by precipitation with mercuric acetate."

Pyridium as a source of interference in vitamin C determinations, C. F. Gannon and T. McGovern (*Soc. Expt. Biol. and Med. Proc., 38 (1938), No. 2, pp. 267–270*).—Pyridium medication has been found to cause erroneously high values in titrations of blood and urine for ascorbic acid even as late as 3 days after medication. It is, therefore, considered inadvisable to use the test on a subject who has had pyridium medication within 5 days.

A method for isolation of ascorbic acid fermentating bacteria, A. I. Kendall and H. Chinn (*Soc. Expt. Biol. and Med. Proc., 38 (1938), No. 1, pp. 8–10*).—Plain nutrient broth is first reinforced with ascorbic acid in the proportion of from 15 to 20 mg of ascorbic acid to 10 cc of broth. The broth is then inoculated with stomach contents, feces, or other material to be tested and incubated at 37° [C.] for from 18 to 30 hr., when a considerable growth will be noted if ascorbic acid fermenting bacteria are present. From this preliminary culture a second broth culture is made, using from 2 to 5 loops for the inoculum After incubation and growth, plates are made on plain or preferably glucose agar, from which, after culture, colonies are picked off and tested for purity and eventually for ascorbic acid utilization. To carry out the latter test 90 cc of

plain broth in an Erlenmeyer flask is first inoculated with the culture and incubated for 18 hr., after which is added 10 cc of a sterile ascorbic acid solution of such strength that the final concentration in the broth will be from 15 to 20 mg per 10 cc of broth. The broth is then distributed in exactly 10-cc amounts in a series of test tubes, incubated, and examined at appropriate intervals for ascorbic acid by mixing exactly 1 cc immediately with approximately 1 cc of glacial acetic acid to arrest growth, diluting to 50 cc with distilled water, and titrating 2 aliquots of 1 cc each with 2,6-dichlorophenolindophenol solution, of which each cubic centimeter is equivalent to 0.02 mg ascorbic acid. It is suggested that the determination be repeated upon a sample which has been saturated with hydrogen sulfide prior to titration to change any reversibly oxidized ascorbic acid to the fully reduced form.

It is stated that 30 cultures of bacteria have been isolated from the gastric contents of achlorhydrics, from a normal artificially fed baby, from the feces of a normal adult, and from the feces of guinea pigs. The cultures consist of members of the *Lactis aerogenes*, or pneumobacillus group, and of the enterococcus group.

A method of counting viable bacteria in milk by means of the microscope, G. Knaysi and M. Ford. (Cornell Univ.). (*Jour. Dairy Sci., 21 (1938), No. 3, pp. 129–141*).—This method consists in mixing 1 cc of milk to be examined with 0.5 cc of a dye mixture containing 0.1 percent methylene blue and 0.1 percent Nile blue sulfate and with 0.5 cc of a solidifying mixture containing 8 percent gelatin and 2 percent agar; then 0.01 cc of this mixture is placed on a slide, covered with a small cover glass, and examined. A count of the stained cells represents all dead cells already present in the milk. To a similar mixture 1 drop of 0.7 or 0.8 N sodium hydroxide is added which causes staining of all cells present in the milk. The difference between the two counts represents the number of viable cells present. Suggestions are offered for using this method in grading raw and pasteurized milk and in determining viable cells in butter cultures and in the bacterial control of other dairy products.

Concerning the accuracy of the methylene blue reduction test, C. K. Johns (*Jour. Dairy Sci., 21 (1938), No. 4, pp. 227–237, figs. 2*).—The author discusses various factors which may affect the accuracy of the methylene blue reduction test and presents original data comparing the reduction time required for different classes of milk by the standard and by a modified method, and when dye concentrations of 1:300,000 and 1:700,000 were used. By inverting the milk tubes hourly (modified method) the reduction time was generally shortened, more uniform decolorization was obtained, and the accuracy of the test greatly increased. Reduction time was prolonged approximately 20 percent when the stronger dye concentration was employed.

A method for the extraction of fat in ice cream in order to determine its purity, W. F. Epple and B. E. Horrall. (Ind. Expt. Sta.). (*Jour. Dairy Sci., 21 (1938), No. 4, pp. 195–197*).—This method consists in shaking the sample of ice cream mix or melted ice cream with glacial acetic acid in a separatory funnel, adding ethyl alcohol and shaking, and finally adding ethyl and petroleum ethers and again shaking. After separation the ether-fat layer is transferred and the ether distilled off. The method proved more efficient and economical and required less time than either the sulfuric acid or ammonium hydroxide methods.

Report on pyridium, H. J. Fisher. (Conn. [New Haven] Expt. Sta.). (*Jour. Assoc. Off. Agr. Chem., 20 (1937), No. 4, pp. 576, 577*).—The associate referee shows that pyridium, which is the dye phenylazo-α-α-diaminopyridine, can be titrated with titanous sulfate. Titration was especially sharp when a small

quantity of light green S F yellowish was used as an indicator. A study of the difficulties encountered in extracting the drug from commercial preparations in a solution suitable for this titration is recommended.

Report on santonin, phenolphthalein, and calomel in tablets, H. J. Fisher. (Conn. [New Haven] Expt. Sta.). (*Jour. Assoc. Off. Agr. Chem., 20 (1937), No. 4, pp. 558–560*).—The associate referee records collaborative work showing satisfactory results for santonin and calomel determined in mixtures of the three drugs named but high results for phenolphthalein. He recommends special attention, in further study, to the determination of phenolphthalein in the presence of santonin.

The determination of small quantities of strychnine, A. G. Murray. (U. S. D. A.). (*Jour. Assoc. Off. Agr. Chem., 20 (1937), No. 4, pp. 638–645*).—The author shows that strychnine in amounts as low as 5 mg can be determined by precipitation with a standard potassium mercuric iodide solution and titration of the excess iodide with standard potassium iodate.

Rapid determination of iron in pharmaceuticals with the aid of cupferron and an immiscible solvent, S. M. Berman, J. J. Chap, and D. M. Taylor. (U. S. D. A.). (*Jour. Assoc. Off. Agr. Chem., 20 (1937), No. 4, pp. 635–638*).—*The authors determined iron by extracting the precipitate of the iron compound of nitrosophenylhydroxylamine (cupferron) in chloroform, evaporating the separated chloroform solution, and igniting the iron compound to constant weight for weighing as ferric oxide or for volumetric determination.*

A titrimetric method for the quantitative estimation of lead in biological materials, M. K. Horwitt and G. R. Cowgill (*Jour. Biol. Chem., 119 (1937), No. 2, pp. 553–564; abs. in Chem. Abs., 31 (1937), No. 19, p. 7081*).—The method described differs from other dithizone technics in that the lead is separated from a given solution by means of dithizone and the resulting lead-dithizone complex is then isolated.

A statistical study of the sampling and analytical errors encountered in analyzing apples for lead spray residues, C. M. Smith and C. C. Cassil (U. S. D. A.). (*Jour. Assoc. Off. Agr. Chem., 20 (1937), No. 4, pp. 617–622, figs. 2*).—The distribution of lead among apples from trees sprayed with lead arsenate has been investigated by means of the dithizone electrolytic method, the error of which has been shown to be negligible in proportion to the apple sampling error. There was some indication that the dispersion of the individual results is proportional to the size of the residue, and that it is increased when the apples are washed. A graph showing the size of samples necessary to show a difference between any two lots of apples is given.

Determination of lead in maple products, J. L. Perlman (*Jour. Assoc. Off. Agr. Chem., 20 (1937), No. 4, pp. 622–627*).—A modified partial digestion method for the determination of lead in maple products is suggested. With the proper apparatus and assistance about 25 samples could be run daily, and a single sample could be reported upon in about 2 hr. Tin, manganese, and reasonable amounts of zinc did not interfere with the lead recovery, as was indicated from the analysis of sirups containing added known quantities of lead plus normal amounts of these contaminants. During the 1937 season in Vermont and New York State control laboratories the lead content of about 1,000 sirups was determined by the method described with no apparent difficulty.

Occurrence and determination of zinc in maple products, J. L. Perlman and J. E. Mensching (*Jour. Assoc. Off. Agr. Chem., 20 (1937), No. 4, pp. 627–631*).—The method detailed is based upon extraction of the zinc, after boiling the diluted sirup with nitric acid and neutralizing, by means of a chloroform solution of diphenylthiocarbazone, extracting the zinc from the chloroform

layer with 1 percent nitric acid (which does not break down the copper compound of the "dithizone"), and titrating iodometrically in the manner indicated by the equation $2K_3Fe(CN)_6+2KI+3ZnSO_4 \rightarrow K_2Zn_3[Fe(CN)_6]_2+3K_2SO_4+I_2$.

Losses of N and C in drying feces of cattle, M. Kleiber, R. W. Caldwell, and H. Johnson. (Univ. Calif.). (*Soc. Expt. Biol. and Med. Proc., 34 (1936), No. 2, pp. 128–130, fig. 1*).—The authors find that nitrogen losses can be avoided by determining in fresh instead of dry samples of the excreta. Determination in fresh samples involves more work than in a composite sample of the dried feces, but this extra work is justified since the losses during drying are considerable.

The wet combustion of feces samples with dichromate could be employed for the determination of the carbon in feces in a procedure similar to that used for nitrogen. The dichromate method of carbon determination did not, however, prove to be as reliable in feces as the combustion of a dry sample in the calorimetric bomb under 25 atmospheres oxygen pressure and subsequent absorption of the CO_2 formed. The authors therefore determine the carbon content of the feces in a dry sample but measure the loss during the preceding drying process in an apparatus so designed as to provide for complete combustion of any volatile carbon compounds given off during the drying. A diagrammatic drawing of this apparatus accompanies the paper. The carbon loss thus recovered amounted to 1.36 ± 0.08 percent of the total carbon content of the sample.

Estimation of worm and insect fragments in tomato products, C. D. Wilder and M. A. Joslyn. (Univ. Calif.). (*Jour. Assoc. Off. Agr. Chem., 20 (1937), No. 4, pp. 648–655, fig. 1*).—The authors suggest an improvement of the usual gasoline flotation procedure by treatment of the mixture with potassium permanganate acidified with sulfuric acid. By this means the pulp is bleached and disintegrated, whereas the matter to be determined is apparently not affected by the oxidation.

Experimental work on cucumber fermentation, IX–XII, F. W. Fabian and E. A. Johnson (*Michigan Sta. Tech. Bul. 157 (1938), pp. 31, pls. 4*).—The results of the experiments recorded in the four parts of this investigation (E. S. R., 74, p. 4) here noted indicate that there are at least three types of softening commonly occurring in pickles. These are (1) softening due to zymological processes, such as action of enzymes, which dissolve the pectic materials present in the middle lamella of the cucumber cells; (2) softening due to chemical changes as in acid hydrolysis which loosens the protopectin from the cellulose of the cell walls, thereby causing a weakening of the cell structure; and (3) softening due to physical processes, such as cooking, which breaks down or loosens the pectic material in the cucumber.

AGRICULTURAL METEOROLOGY

A brief list of works on meteorology, compiled by R. T. Zoch (*U. S. Mo. Weather Rev., 66 (1938), No. 1, pp. 1–3*).—This list includes 189 references, of which a considerable number deal directly or indirectly with agricultural meteorology.

Weather of 1937 in the United States, J. P. Kohler (*U. S. Mo. Weather Rev., 66 (1938), No. 1, pp. 12–14, pls. 2*).—Outstanding features of the weather of the United States in 1937 were the great flood in the lower Ohio and Mississippi Valleys due to excessive rains in January over the drainage areas of the Ohio River and its tributaries; excessive drought in Montana and in the north and central Plains; lack of normal rainfall in late summer and early

fall, seriously hampering plowing and seeding of late grain in the northern portions of the Missouri and Mississippi Valleys; severe cold in January throughout the Rocky Mountains, north-central Great Plains, and upper Mississippi Valley; low January temperatures in California, which resulted in two destructive freezes, and backward spring weather in the northern Rockies and northern Plains States; and exceptionally warm January weather in the Southeastern States, particularly in Alabama, followed by severely damaging cold weather during March.

For the United States as a whole, precipitation averaged 0.4 in. in excess of normal. Annual averages were decidedly in excess in the Atlantic coast and east Gulf sections and also in the north and middle Pacific districts. There was a large interior area of subnormal warmth, while the rest of the country, except small local areas, averaged above normal. There was marked freedom from destructive storms, especially in the Southeastern States.

Climatological data for the United States by sections, [January–December 1937] (*U. S. Dept. Agr., Weather Bur. Climat. Data, 24 (1937), Nos. 1–12, [about 200 pp., 3 pls., 3 figs. each]*).—These numbers contain the usual brief summaries and detailed tabular statements of climatological data for each State.

Monthly Weather Review, [January–February 1938] (*U. S. Mo. Weather Rev., 66 (1938), Nos. 1, pp. 33, pls. 13, figs. 9; 2, pp. 35–62, pls. 26, fig. 1*).—In addition to the usual detailed summaries of climatological data, solar and aerological observations, observations on weather on the Atlantic and Pacific Oceans and on rivers and floods, and bibliographical and other information, these numbers contain the following contributions:

No. 1.—A Brief List of Works on Meteorology, compiled by R. T. Zoch (pp. 1–3) (see p. 299); Upper Wind Forecasting, by B. C. Haynes (pp. 4–6); Air Masses of Southern Brazil, by A. Serra and L. Ratisbonna (pp. 6–8); Duststorms of May–December 1937 in the United States, by R. J. Martin (pp. 9–12); and Weather of 1937 in the United States, by J. P. Kohler (pp. 12–14) (see p. 299).

No. 2.—Springs That Mysteriously Ebb and Flow, by W. J. Humphreys (p. 35); Geography and Rainfall of the Nebraska Sandhills, by B. E. Hall (pp. 36–38) (see below); and The Normal Temperature Distribution of the Surface Water of the Western North Atlantic Ocean, by G. Slocum (pp. 39–43).

Geography and rainfall of the Nebraska sandhills, B. E. Hall (*U. S. Mo. Weather Rev., 66 (1938), No. 2, pp. 36–38*).—In his general summing up of the study of rainfall of the Nebraska sandhills, an area outside the eastern zone of heavy precipitation, the author says: "Heavy precipitation in the sandhills almost always comes from a Colorado low, or one located somewhat to the east of Colorado. In other words, a low coming from the southwest, or south-southwest, brings the heaviest precipitation to the Nebraska sandhills. During the past few years southwestern lows have been fewer than usual, and their occurrence did not always bring precipitation. However, there is no scientific reason for believing that the 'drought years' constitute a permanent change in climate. Doubtless the future will again bring more rain to the sandhills."

SOILS—FERTILIZERS

[Soil and fertilizer work at the Arkansas Station] (*Arkansas Sta. Bul. 351 (1938), pp. 20–23, 28*).—The report contains notes on erosion of Arkansas soils, by O. R. Younge and R. P. Bartholomew; use of lime in fertilizer mixtures, increase in organic content of soils by legumes, and variation in productivity, all by Bartholomew; tests of productivity of Ruston fine sandy loam, by Younge; extracting a submerged soil solution, by L. C. Kapp; and influence of soil

management practices on water and soil losses, by Bartholomew, D. G. Carter, Kapp, and W. C. Hurlburt.

[Soil investigations by the New Haven Station] (*Connecticut [New Haven] Sta. Bul. 409 (1938), pp. 308–311*).—Investigations of leaching losses in a year of excessive rainfall, apple orchard soils in Connecticut, vegetable fertilizer results at Windsor, and soil amendment trials are noted.

[Soil investigations of the Maryland Station], J. E. Metzger (*Maryland Sta. Rpt., 1937, pp. XX–XXII*).—The report contains notes on soil classification and soil management and fertility.

[Soil investigations by the New Jersey Stations] (*New Jersey Stas. Rpt. 1937, pp. 105–112*).—The report notes briefly nitrogen availability studies; phosphate fixation and availability; comparison of magnesium and nonmagnesium forms of lime; influence of organic matter (rye straw) on crop yields and on the composition of the soil; value of legumes in maintaining soil fertility; influence of potash on crop yield and on the amount of available potash in the soil; correction of soils rendered toxic by the use of arsenic; study of the effect of boron and manganese on plant growth in some New Jersey Coastal Plain soils; soil profile, base exchange, and lysimeter studies; antagonistic relationships of micro-organisms; lactic acid production by *Rhizopus*; decomposition of lignin by micro-organisms; interrelations between plants and micro-organisms; and a microbiological (*Aspergillus niger*) method of determining available phosphorus and potassium in soil.

[Soil and fertilizer work of the South Carolina Station] (*South Carolina Sta. Rpt. 1937, pp. 80–82, 130–135, fig. 1*).—The report contains notes on chemical composition of clippings of carpet grass from pasture plats receiving various fertilizer treatments, by H. P. Cooper, J. H. Mitchell, E. D. Kyzer, and T. M. Clyburn; and lysimeter investigations with crotalaria and millet, by N. McKaig, Jr., and E. M. Roller.

[Soil investigations of the Washington Station]. (Partly coop. U. S. D. A.). (*Washington Sta. Bul. 354 (1937), pp. 19–22, 63*).—The report notes briefly investigations of the use of supplements to barnyard manure and the maintenance of organic matter in eastern Washington soils, both by L. C. Wheeting and S. C. Vandecaveye; maintenance of organic matter in central Washington, by Wheeting, Vandecaveye, and H. D. Jacquot; and investigations of the effect of accumulations of arsenical sprays in orchard soils on their loss in productivity, by Kardos, Vandecaveye, and C. M. Keaton. The Adams Substation reports upon tillage and soil moisture problems, erosion control and run-off, and permanent fertility and organic matter maintenance, all by Jacquot.

[Soil Survey Reports, 1930, 1932, 1933, and 1934 Series] (*U. S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpts.], Ser. 1930, No. 47, pp. 68, pl. 1, figs. 3, map 1; 1932, Nos. 20, pp. 31, figs. 2, map 1; 23, pp. 55, figs. 2, map 1; 1933, Nos. 13, pp. 76, pls. 4, figs. 3, map 1; 14, pp. 48, figs. 2, map 1; 16, pp. 45, figs. 2, map 1; 1934, Nos. 1, pp. 34, figs. 2, map 1; 2, pp. 29, pls. 2, figs. 2, map 1; 3, pp. 38, figs. 2, map 1; 4, pp. 27, figs. 2, map 1*).—Except as indicated below, these surveys were made in cooperation with the respective State experiment stations: 1930, No. 47, Pike County, Ind., H. P. Ulrich et al.; 1932, Nos. 20, Surry County, N. C., W. A. Davis and E. F. Goldston, and 23, Franklin County, Iowa, T. H. Benton and F. R. Lesh; 1933, Nos. 13, Napa area, Calif., E. J. Carpenter and S. W. Cosby, 14, Pocahontas County, W. Va., B. H. Williams and H. M. Fridley, and 16, Wyoming County, N. Y., C. S. Pearson et al. ([N. Y.] Cornell); and 1934, Nos. 1, Loup County, Nebr., B. Abaskin and F. A. Hayes, and 3, Garfield County, Nebr., B. Abaskin et al. (both with Univ. Nebr.), and 2, Pamlico County, N. C., J. T. Miller and A. E. Taylor, and 4, Jones County, N. C., W. A. Davis et al.

Soils of Fergus County: Soil reconnoissance of Montana.—Preliminary report, L. F. GIESEKER. (Coop. U. S. D. A.). (*Montana Sta. Bul. 355 (1938), pp. 82, fig. 1, maps 4*).—Fergus County, central Montana, has an area of 4,827 sq. miles inclusive of rolling plains, foothills, and mountainous areas. The soils form 28 series and include 74 types and phases. Forests, rock outcrops, bad lands, and mountains total 18.1 percent.

Soil science and mineralogy, C. E. MARSHALL. (Mo. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc., 1 (1936), pp. 23–31*).—This discussion points out the probability that mineralogical study will make it necessary to modify, and even to discard, some accepted concepts. "For instance, we have ascribed great importance to the $SiO_2:R_2O_3$ ratio. But within the montmorillonite-beidellite-nontronite series this ratio does not satisfactorily define the layer replacements, and shows no simple relationship to the base-exchange capacity. Only in lateritic soils, where we are dealing with simple mixtures of hydroxides of iron and aluminum with clays of the kaolin group, can it be satisfactorily used. As soon as the 2:1 lattice type makes its appearance, the $SiO_2:R_2O_3$ ratio becomes almost meaningless.

"The soil mineralogy of the future has many tasks before it. It has to trace the detailed relationships between chemical constitution and physical properties in the whole group of the clays. It has to formulate in its own terms the processes of rock weathering and of soil formation. Finally, it has to hand over to the soil physicist workable concepts which he can use in his studies of soil structure. Therefore, it seems likely that mineralogy is destined to be of increasing importance in soil science, and one can see already that in this new field of the colloidal minerals soil science will eventually repay some of its debt to mineralogy."

Procedure for special type of mechanical and mineralogical soil analysis, E. TRUOG, J. R. TAYLOR, JR., R. W. PEARSON, M. E. WEEKS, and R. W. SIMONSON. (Wis. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc., 1 (1936), pp. 101–112, figs. 3*).—In mineralogical and mechanical soil analyses requiring the removal of free iron and aluminum oxides, as well as colloidal silica and organic matter, it has been shown that "the addition of oxalic acid to a soil suspension containing sodium sulfide, producing nascent hydrogen sulfide, is many times more effective than ordinary hydrogen sulfide for this purpose. With this improved procedure, it is possible to dissolve the free iron oxide in about 10 min. without greater acidification than pH 3.5. Free alumina is also dissolved. Boiling for a few minutes right after the addition of the sodium sulfide, which is quite alkaline, serves to dissolve colloidal silica. The amounts of these constituents dissolved are later added to the clay fraction. After this pretreatment and subsequent saturation with sodium, the soil is in ideal condition for mechanical and mineralogical analysis."

Adoption of 2μ as the upper limit of clay particle size is recommended on the ground that clay thus separated consists largely of secondary minerals along with a few very resistant primary minerals, such as quartz and muscovite. "Feldspars, the major group of primary minerals, are practically extinct below 2μ. Separation at 5μ does not allow this simple and desirable assumption."

Mechanical and mineralogical subdivision of the clay separate of soils, E. TRUOG, J. R. TAYLOR, JR., R. W. SIMONSON, and M. E. WEEKS. (Wis. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc., 1 (1936), pp. 175–179*).—A largely methodological study has shown, in part, that "when clay from the A horizon of soils is separated so as to have an upper limit of particle size of 2μ, it, at least when formed in humid climates, is practically devoid of primary minerals that weather easily, like the feldspars. Certain minerals, particularly quartz and muscovite, which are relatively stable toward chemical weathering agents, are prob-

ably often present in both primary and secondary form. Clay thus separated consists almost entirely of material which exhibits great resistance to further decomposition, although portions of it may be very reactive as regards base exchange and fixation of phosphorus and potassium. If the separation is made at the 5μ point, appreciable amounts of feldspar and possibly other minerals that weather easily may still be present. The writers, therefore, favor separation at the 2μ point.

"When the clay separate is thus obtained from a soil which has been pretreated so as to remove organic matter, free iron oxides, and colloidal silica, it is possible to make a rather clean-cut subdivision of this separate at 0.2μ into coarse and fine clay or colloid. The fine fraction usually contains nearly all of the true base-exchange material and probably some quartz, muscovite, and other very stable minerals. The coarse fraction has altogether different chemical and physical properties, besides low base-exchange capacity. It probably consists of muscovite and quartz and possibly talc, kaolinite, and other secondary minerals, which may be separated by means of heavy liquid specific gravity separations. For making the mechanical separation, a centrifuge equipped with an angle or conical head, direct reading speedometer, and time switch is essential. It takes about 25 washings to make a satisfactory separation. A special machine for thorough shaking at each washing is also essential."

A method for the microscopic examination of the natural structure and pore space in soils, H. J. Harper and G. W. Volk. (Okla. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc., 1 (1936), pp. 39–42, figs. 2*).—A grinding and polishing technic, in part similar to the paleobotanical method for the preparation of rock sections (E. S. R., 70, p. 454), is described.

"Thin lacquer penetrates porous substances readily, and no heating is required when this material is applied to the soil. It dries quickly and cements loose particles into a solid mass. Ordinary brushing lacquer [clear], diluted with two parts of lacquer thinner and applied to a lump of soil, can be dried in a current of air or in an electric oven in a few minutes. When a treated mass of soil is being ground in order to prepare a smooth face for study, additional applications of thinned lacquer should be applied if microscopic examination indicates that a disintegration of the soil structure is occurring during the grinding process. Two or three applications may be needed to develop the desired cementing effect when large particles of quartz or other hard minerals are encountered. When a smooth surface with a high polish has been obtained by grinding one side of an undisturbed block of soil with fine emery paper, it is cemented to a glass slide with colorless lacquer and the opposite side of the soil mass is ground until a thin section is obtained. Dust particles collecting in the large pores must be carefully removed before additional lacquer treatments are applied." A petrographic microscope was used. Photomicrographs, × 22, showing the noncapillary pore space at various depths in six profiles are shown. Progress in the adaptation of the method for high power work is mentioned.

Pore space-clay ratio, an important index to the physical character of soil, H. J. Harper. (Okla. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc., 1 (1936), pp. 33–37*).—"Soils which have a favorable physical condition for moisture absorption and crop production have a pore space: clay ratio which is above 1.5. Values below 1 are unfavorable for moisture absorption and plant development under the climatic conditions which prevail in Oklahoma. When soils contain very small percentages of silt and clay, the percentage of fine and very fine sand are the most important factors in relation to moisture retention and plant development. High volume weight and high clay content indicate a dense soil. Low volume weight and high clay content cannot be definitely associated with

the presence of noncapillary pore space, but this relation occurs in the normal soils which have been studied in this investigation."

Variation of the soil colloids formed from similar parent material, I. C. Brown and H. G. Byers. (U. S. D. A.). (*Soil Sci. Soc. Amer. Proc., 1 (1936), pp. 171–173*).—This investigation reported indicates that "while the character of vegetation undoubtedly influences profile development, yet temperature appears to be the controlling factor where rainfall is abundant. Time also is an important factor. The podzolic character of a soil may develop quickly long before parent rocks have been thoroughly decomposed and may persist in lateritic soils after destruction of the rock minerals is fairly complete. The constitutional water of soil colloids becomes more intimately dependent upon the aluminosilicate content as the soils become more highly laterized."

Detection of freezing point by dielectric measurements, L. T. Alexander, T. M. Shaw, and R. J. Muckenhirn. (U. S. D. A.). (*Soil Sci. Soc. Amer. Proc., 1 (1936), pp. 113–119, figs. 6*).—In this method a special condenser, in which the sample may be placed between the conductors, is connected in parallel with a calibrated variable condenser, a vacuum tube voltmeter, and an inductance which is placed in inductive relationship with an 1,800-kc crystal oscillator. Since water, in the pure state, has a dielectric constant of about 80 in the liquid state and about 4 in the frozen condition, a sharp detuning of the circuit described was to be expected upon freezing of the moisture content of a soil sample placed between the condenser conductors.

"The method seems to offer the possibility of making freezing-point depression measurements in colloidal materials under equilibrium conditions, hence making thermodynamic interpretation possible. The method offers possibility of use wherever ice separates as a pure phase during freezing."

Physical and chemical studies of subsoils (*[Connecticut] Storrs Sta. Bul. 221 (1937), pp. 14, 15*).—Experiments showing the neutralizing effect to 12 in. depth from a heavy application of limestone 20 yr. ago are briefly reported upon.

The number of colonies on plaques of soil made from samples taken from various horizons, J. K. Wilson. (Cornell Univ.). (*Soil Sci. Soc. Amer. Proc., 1 (1936), pp. 205–209*).—With the use of magnesium ammonium phosphate in a procedure which the author has previously shown always to provide conditions favorable to the development of macroscopic colonies from any *Azotobacter* present (E. S. R., 77, p. 451), the samples of soil from depths sometimes as great as 15 ft. were shown to contain the organisms capable of forming macroscopic colonies. The samples represent 19 soil series and 25 types, the observations being recorded from the 2-, 8-, 16-, 24-, and 32-in. depths in some of the soils and for horizons A_1, A_2, A_3, B_1, B_2, B_3, and C_1 in other soils.

"Whatever the identity of these organisms appearing on the plaques may be, the present study indicates that organisms capable of producing macroscopic colonies permeate the various horizons of the soil down to the unweathered parent material, and that certain of the lower horizons may be rather rich in this flora when compared with the numbers present in a horizon nearer the surface. . . . The fact that lower horizons may harbor a rather luxuriant flora of this type suggests that when the upper horizon of the soil is made suitable for these organisms by applications of such materials as limestone or various fertilizers, they may also contribute to this newly established flora in the surface horizon."

Pure cultures of algae from soil, J. K. Wilson. (Cornell Univ.). (*Soil Sci. Soc. Amer. Proc., 1 (1936), pp. 211, 212*).—A procedure for obtaining soil algae in pure culture has been developed.

"The selective medium . . . consists of any nutrient solution in which the algae will grow and which contains no organic carbon. The following was employed in this work: Calcium nitrate 1 g, potassium chloride 0.25, magnesium sulfate 0.25, monopotassium phosphate 0.25, ferric chloride 0.3 g, tap water 3,000 cc. . . . After sterilization, a series of . . . flasks is inoculated with a suspension of soil representing fractions of a gram, not to exceed 1 to 10,000. These flasks are then placed in light so that photosynthesis will occur. In about 10 days, the solution will be green, with algal cells. When this occurs the flask selected for use should be shaken vigorously to disperse the growth evenly throughout the medium. From this homogeneous material, 1 cc should be transferred to some of the sterile original nutrient solution and the culture placed in light where the algae will develop and produce the enriched culture. This can now be prepared for use in making plates, employing a solid medium. Success will be more easily attained if the growth is not too old.

"The enriched culture should be shaken vigorously also. This breaks the algal filaments into fragments and disperses the growth in general, dislodging many of the organisms such as bacteria that may be adhering to the algal cells. The whole quantity in the flask should be filtered, a paper being employed that will hold the algal cells and permit smaller organisms to go through. Sterile water should be employed to complete the differential separation on the filter. After a thorough washing, the filter paper should be transferred to sterile water in which the algal cells can be dispersed. A dispersion machine may be employed to accomplish this. Quantities of this suspension ranging from 1 to 0.1 cc may now be distributed in a series of sterile Petri dishes. . . .

"The solid medium for plating is the nutrient solution that was employed to make the enriched culture to which is added about 1 to 1.5 percent agar. It is best to have a medium that is not too firm."

The effect of forest litter removal upon the structure of the mineral soil, H. A. Lunt. (Conn. [New Haven] Expt. Sta.). (*Soil Sci. Soc. Amer. Proc., 1 (1936), p. 59*).—The removal of litter lessened the percentage of aggregates in the first inch of surface soil by about 40 percent in 3½ yr. In the next 2 in. the decrease was between 11 and 24 percent. The decrease in the aggregate content of the first inch of surface soil reached 58 percent in 2½ yr. under some conditions.

Studies in soil humus.—II, Potentiometric study of the formation of humic acid and humates, A. N. Puri and A. Sarup (*Soil Sci., 45 (1938), No. 2, pp. 165–174, figs. 9*).—In part 2 of this serial contribution (E. S. R., 78, p. 295) the formation of humic acid and of humates was studied by following the changes in the H-ion concentration of the reaction media. It is shown that the complete precipitation of humic acid and of insoluble humates from sodium humate takes place when all of the sodium in the sodium humate has been replaced. The bearing of this observation on the lack of stoichiometric proportion in humates is discussed.

New mechanical technique to develop vegetative cover, F. E. Hardisty, G. F. DeLong, and R. L. Dolvin. (U. S. D. A.) (*Agr. Engin., 19 (1938), No. 1, pp. 11, 12, 16, fig. 1*).—In this brief contribution new mechanical methods for quick development of vegetative cover that have been under trial are described. These consist chiefly of a combination of subsoiling to a depth of approximately 18 in., mechanical sowing of grass sprigs or propagation of cover from seed, and mechanical mulching by means of a manure spreader.

Soil erosion by wind in Kansas (*Kans. State Bd. Agr. Rpt., 56 (1937), No. 224-A, pp. 87, figs. 60*).—This bulletin deals with Soil Blowing in Kansas and Methods of Control, by R. I. Throckmorton and L. L. Compton (pp. 7–44),

The Kansas Soil Drifting Law (pp. 45–47), Observations and Warnings of 1920 (pp. 48, 49), and Surveys of Soil Blowing, 1937 (County Summaries), by W. A. Atchison (pp. 50–86), made in cooperation with the Kansas State College and in compliance with the State law. It shows the substantial progress that has been made in developing and putting into effect practical methods of mitigating the causes and consequences of wind erosion of soil. It emphasizes especially the necessity of community action in putting into effect emergency measures as well as permanent programs.

The effect of calcium on the erodibility of soils, T. C. PEELE. (U. S. D. A.). (*Soil Sci. Soc. Amer. Proc., 1 (1936), pp. 47–58, figs. 7*).—Measurements of percolation rate, crushing strength, and penetration resistance are reported and discussed. A part of the results recorded were as follows:

"The addition of calcium carbonate to the B horizon of Appling, Davidson, and Cecil soils decreased the permeability in each case as measured by the percolation rate in artificially packed tubes. In the case of the Iredell soil the addition of calcium carbonate had little effect on the percolation rate, which was originally very slow. The addition to the Cecil soil of calcium chloride or calcium hydroxide caused a large decrease in the percolation rate. In the case of the hydroxide, however, this effect seemed partially to disappear after a large excess of calcium hydroxide had been added. The addition of calcium to the Cecil soil caused a decrease in permeability whether the calcium was added immediately before the permeability determination or composted for 2 mo. prior to the determination. The addition of calcium carbonate to Appling, Davidson, and Cecil soils produced an increase in the percentage of aggregates having diameters between 0.03 and 0.01 mm, which could have occurred only by a decrease in the percentage of larger aggregates. The addition of calcium carbonate to Iredell had little if any effect on its state of aggregation."

Influence of fertilizers on the concentration of the soil solution, L. M. WHITE and W. H. ROSS. (U. S. D. A.). (*Soil Sci. Soc. Amer. Proc., 1 (1936), pp. 181–186, figs. 2*)—A study has been made of the action of fertilizers in increasing the combined ionic and molecular concentration of the soil solution from a Norfolk sandy loam soil and a Cecil clay loam soil.

"The same application of a fertilizer material increases the effective concentration of the soil solution in the Norfolk soil much more than in the Cecil soil, but the materials used in the tests fall in the same order for both soils when arranged according to their influence in changing the concentration of the soil solution. This arrangement in descending order is as follows: $NaNO_3$, $(NH_4)_2SO_4$, KCl, K_2SO_4, $NH_4H_2PO_4$, and $Ca(H_2PO_4)_2.H_2O$. The influence of a mixed fertilizer on the effective concentration of a soil solution depends on its composition and not on its total content of the plant food elements."

Total nitrogen changes in certain Colorado soils as determined by the Kjeldahl method, H. W. REUSZER. (Colo. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc., 1 (1936), p. 195*).—In an incubation of eight soils, both with and without added cellulose, the results of nitrogen determinations made at 30-day intervals during 4 mo. were subjected to a statistical analysis in order to determine the significance of the differences occurring. "While appreciable differences in total nitrogen occurred, as determined by the Kjeldahl method, few of these differences were statistically significant. In the untreated soils there were no significant increases in total nitrogen. The total nitrogen of the soils to which cellulose was added was higher than in the untreated soils at the intermediate periods of incubation, but at the end of 4 mo. all the soils had essentially the same nitrogen content as at the beginning."

"Root solubility" of the essential elements in the soil as an indication of availability, S. F. THORNTON. (Ind. Expt. Sta.). (*Soil Sci. Soc. Amer.*

Proc., *1 (1936), pp. 125–129*).—The author considers that the Neubauer method (E. S. R., 53, p. 319) indicates true availability with an accuracy sufficient to permit its use in the standardization and calibration of chemical tests for available phosphate and potassium.

Results from Cunninghamella plaque tests for available phosphorus in calcareous soils, H. W. REUSZER. (Colo. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc., 1 (1936), pp. 197–204, fig. 1*).—In this investigation "the data indicated distinct possibilities for the *Cunninghamella* plaque method as a test for available phosphorus in calcareous soils." However, "on the whole the results obtained on the 35 field soils do not indicate a greater reliability for the *Cunninghamella* test than for the sodium acetate extraction method of Dahlberg and Brown [E. S. R., 67, p. 652]. The simplicity of the former method, its apparent relation to available phosphate added to the soil in laboratory studies, and the correlation between it and field results in many soils encourage further studies seeking to discover the causes for discrepancy in certain other soils."

Fixation of potassium in soils, J. S. JOFFE and L. KOLODNY. (N. J. Expt. Stas.). (*Soil Sci. Soc. Amer. Proc., 1 (1936), pp. 187–192, fig. 1*).—Investigation has shown that the silicates of iron, aluminum, calcium, and magnesium do not fix potassium, but the phosphates of the elements named do fix potassium when subjected to such alternate wetting and drying as occur in natural soils. With increase in the drying temperature the fixation increased. A low pH value also increased the fixation. It is further indicated that "first, soils subjected to meteorological conditions of intermittent drying and wetting will fix potassium, and the quantity fixed will depend, in part at least, on the PO_4 in circulation. Second, the problem of the release of the K fixed is intimately tied up with that of the mobilization of phosphates. These two points are associated with the problem of the nature of the complexes which fix potassium."

The relation of free iron in the soil to aggregation, J. F. LUTZ. (N. C. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc., 1 (1936), pp. 43–45, fig. 1*).—The author expresses the opinion that "free" iron compounds in the soil act, when in solution, as flocculating agents and, when in the hydrated gel condition, as cementing agents, the cementing action occurring upon dehydration, with concomitant granulation of the flocculated clay.

Registration, labeling, and inspection of commercial fertilizers, 1937, F. B. MUMFORD, L. D. HAIGH, and E. W. COWAN (*Missouri Sta. Bul. 393 (1938), pp. 46*).—This report of the usual analytical data covers the fertilizers examined for 1937. With reference to residual acidity it is noted that, in the 1937 sales, "the largely used brands for grain crops are either nonacid or only slightly acid, while certain others are acid-forming. In general, the fertilizer companies have shown a commendable willingness to adjust the basicity of their mixtures wherever crop growing conditions would seem to indicate that such was desirable."

Fertilizer analysis, W. L. ADAMS, T. WRIGHT, JR., and L. LINTON (*Rhode Island Sta. Ann. Feed and Fert. Circ., 1937, pp. 51–67*).—In addition to the usual data, this report upon the 1937 inspection notes the potential reaction of each fertilizer analyzed as "A" (acid-forming) or "NA" (non-acid-forming). Fertilizer chemicals, dried manures, and limes are included.

AGRICULTURAL BOTANY

Plant physiology: From its organization to the present, C. O. APPLEMAN (*Maryland Sta. Rpt. 1937, pp. XXX, XXXI*).—This is a brief summary of the contributions from the plant physiology laboratory of the station, organized in 1910.

Plant physiology (*New Jersey Stas. Rpt. 1937, pp. 84–92*).—Progress reports are given on the following work: Level of the boron supply in relation to nitrogen metabolism in cotton; effect of aeration on the growth of oat plants in solution cultures; a biological test for the boron content of seeds; manganese and boron deficiency and toxicity studies—range of concentrations for normal growth, and comparison of a monocotyledonous with a dicotyledonous species; iron, zinc, and copper nutrition studies with corn; a study of the development and composition of plant tissues associated with the absorption and assimilation of nitrate as compared with ammonium nitrogen by plants grown with culture solutions of high and low salt concentration; growth of beet plants in sand culture with nutrient solutions varying in potassium concentration but otherwise complete; effect of boron deficiency on the growth of tomato and on the rate of absorption of nitrogen from culture solution; and growth of white clover in sand culture with solutions of low and high phosphorus concentrations.

The genus Cooperia, H. H. Hume (Univ. Fla.). (*Bul. Torrey Bot. Club, 65 (1938), No. 2, pp. 79–87*).—This article reviews the history of this bulbous genus, presents a key to and descriptions and notes on the four species considered valid, discusses their garden values, and refers to two species excluded from the genus.

Plants as indicators of climate in northeast Mexico, C. H. Muller (*Amer. Midland Nat., 18 (1937), No. 6, pp. 986–1000, figs. 18*).—Five major climatic types distinguished in a cross section of the Sierra Madre Oriental in the State of Nuevo León are described and their characteristic plant associations noted, viz, the warm and arid, cool and semiarid, cool and subhumid, cold and humid, and cold and semiarid. It is concluded that the climate of an area may be evaluated in terms correlated with fitness for plant growth—a fact valuable alike to ecologists and geographers.

The growth of yeast in a magnetic field, G. C. Kimball (Cornell Univ.). (*Jour. Bact., 35 (1938), No. 2, pp. 109–122, figs. 3*).

The effect of 1, 2, 5, 6-dibenzanthracene on the growth and respiration of yeast, E. S. Cook, M. J. Hart, and R. A. Joly (*Science, 87 (1938), No. 2258, p. 331*).—In proper concentration (9×10^{-4} M) this substance induced an increase in yeast proliferation of ± 50 percent. High concentrations (3×10^{-4}) stimulated respiration, while lower ones depressed it. It is deemed apparent that concentration is important in determining its effects.

Fungus growth as affected by varying concentrations of salts, R. B. Zumstein (*Ind. Acad. Sci. Proc., 52 (1936), pp. 86, 87, fig. 1*).—Difco potato dextrose agar was made more effective by adding the mineral salts usually considered of nutritive value (KNO_3, KCl, $NaNO_3$, and NaCl), the effectiveness of each being limited by the molar concentration as tested on *Phytophthora cactorum*. The total average growth for each salt indicated KCl to give the most growth for the average of the six concentrations used.

The preservation of bacterial cultures, I, H. E. Morton and E. J. Pulaski (*Jour. Bact., 35 (1938), No. 2, pp. 163–183, fig. 1*).—"In laboratories where it is necessary to make frequent transplants from stock cultures, a very practical method is to maintain them under sterile paraffin oil. The points in favor of the method are many. . . . The method of preserving cultures by sealing the tubes in a flame is of questionable practical value, if the original characteristics of a culture are to be preserved. . . . Preservation of cultures in the dried state has the advantages that (1) less space is required for storage, (2) the cultures are more easily transported, and (3) certain immunological properties apparently are maintained. The disadvantages are that the cost of the special equipment (centrifuge, vacuum pump, etc.) is prohibitive in

some laboratories; likewise, the time and effort which must be expended if a large collection of cultures is to be so preserved."

Effect of hydrogen-ion concentration on Chlorella photosynthesis, R. Emerson and L. Green (*Plant Physiol., 13 (1938), No. 1, pp. 157–168, figs. 2*).—For the present, this study of the influence of pH on photosynthesis stops at the upper range of CO_2 concentrations obtainable in carbonate mixtures. At saturating concentrations of CO_2 neither the hydrogen- nor the bicarbonate-ion concentration influences the photosynthetic rate from pH 4.6 to 8.9. There is good evidence that in the carbonate mixtures where the CO_2 concentration is lower and the pH greater, other factors than the concentration of free CO_2 play a role in controlling the photosynthetic rate. Probably these factors are the concentrations of bicarbonate and carbonate ions. It is impossible to say how great a change in internal pH is induced by changing the external pH from 4.6 to 8.9, but that there is some change in internal pH is indicated by the respiratory behavior, which seems to be about 30 percent higher at pH 4.6 than at 7 or 8.9. If it were possible to establish the pH range at the chloroplast over which photosynthesis is constant, it would aid in forming opinions as to the merits of any proposed mechanism of photosynthesis.

Bud regeneration and electrical polarities in *Phaseolus multiflorus*, W. S. Rehm (*Plant Physiol., 13 (1938), No. 1, pp. 81–101, figs. 5*).—Using small glass pipes filled with Shive's solution inserted into the plants for leading off the internal electrical potentials, the polarities within the nodal region were found to have the same orientation as the external polarities. Decapitation of a plant caused a large increase in the magnitude of the nodal potentials in the node directly below the decapitation point, a small effect in the second below, and none in the third. Cutting a portion from the stem of a decapitated plant induced a similar but smaller response. Crushing the stem of an intact plant also induced a response similar but smaller than that to decapitation. After decapitation the nodal potentials returned to their former magnitude in about an hour and then steadily decreased until inverted or of small magnitude, this decrease always preceding the first signs of bud regeneration. In decapitated plants with only one bud growing, the nodal potential corresponding to the growing bud was definitely more positive than the nodal potential corresponding to the inhibited bud, while in plants with both buds growing, the nodal potentials were approximately of the same magnitude. Similarly, in decapitated plants the growing bud base was negative to that of the inhibited bud, and in plants with both buds growing this potential difference was of relatively small magnitude. In decapitated plants the growing-bud top was negative to the inhibited-bud top. In intact plants the apex was negative to the base, while the apex of the second internode was positive to its base. Currents applied in various ways across the nodes of intact plants failed to release the bud inhibition except after a portion of the stem had been killed and dried out. Certain effects of the current not directly related to bud inhibition were also observed.

It is concluded that the response of the nodal potentials to the immediate effect of decapitation is probably not a causal factor in bud regeneration. It is also pointed out that there is a definite positive correlation between the inhibited and the regenerated buds, and the bioelectrical potentials. The interpretation of the effect of the applied current is discussed, and a bibliography of 27 references is included.

Laboratory measurement of evapo-transpiration losses, R. L. Parshall (*Jour. Forestry, 35 (1937), No. 11, pp. 1033–1040*).—A displacement-weighing method for determining the loss by evaporation was devised for this work and is described in detail. The Mariotte automatic control units used to

measure the rate and amount of the evapo-transpiration losses were found to operate satisfactorily. The results of the study are not conclusive as to the actual use of water by plants when growing in a natural environment. It is deemed probable, however, that the evapo-transpiration losses under actual field conditions would be less than those reported, in much the same ratio found for evaporation from a large body of water as compared to that from a small evaporation pan. The present results were reasonably consistent but did not represent enough observations on any one crop to establish definite relations. The use of water by sweetclover indicated a relatively heavy draft on the soil moisture of the free water supply held at the elevation level of the water table when it was near the surface

Root resistance as a cause of the absorption lag, P. J. KRAMER (*Amer. Jour. Bot., 25 (1938), No. 2, pp. 110–113, figs. 3*).—The results of these studies on sunflower and tomato indicate that living cells between the epidermis and xylem offer considerable resistance to water passage and are probably responsible for a large part of the lag of absorption behind transpiration at normal temperatures. This resistance was much greater at low than at high temperatures, probably because both protoplasmic and water viscosity increases with lowering of temperatures. The increased resistance to water movement is thought to be the chief reason why plants are unable to absorb sufficient water at low temperatures.

The conducting system of sunflower stems offers but little resistance to water movement. Stem resistance thus is thought to be negligible in causing the absorption lag in herbaceous species and likewise in some woody plants.

Upward movement of inorganic solutes as affected by a girdle, H. F. CLEMENTS and C. J. ENGARD. (State Col. Wash.). (*Plant Physiol., 13 (1938), No. 1, pp. 103–122, figs. 9*).—Data for these girdling tests are given for poplar, willow, dogwood (growing in two localities), mountain-ash, Russian pea (*Caragana arborescens*), lilac, honeysuckle, apple, and crabapple. Of the shoots of each, selected in groups of three, one was girdled, a second was removed at the time of girdling, and a third at the time the girdled shoot was removed. The difference in ash and nitrogen contents between (1) and (2) indicated the amounts passing the girdle, and the difference between (1) and (3) the effects which the girdle imposed on the upward movement of the transpiration stream and its contained salts.

The results indicated that considerable amounts of both ash and nitrogen passed the girdle, and that the influence of the girdle was somewhat characteristic of the species and environment involved. The effects of the girdle on the development of the parts above it appeared to be as follows: Removal of a ring of bark prevented the formation of new xylem at that point. Even with the most careful removal, involving no mechanical injury, and with the wound carefully covered, the living xylem cells died as a result of isolation from the living phloem cells, and as a result of this and the actual exposure of the xylem, the outer layers of conducting cells lost their water-conducting capacity. As a result of the effects noted, the girdle necessitates a transfer of water from one annual ring to another, and the number, size, and distribution of the tracheae in the annual wood ring seems to determine the rate at which water and its dissolved salts can be thus transferred. There was good correlation between the tracheal distribution in the xylem and the amounts of minerals passing the girdles. It is concluded that the girdle, as a break in the phloem continuity, apparently does not affect the upward movement of salts, but rather that, as it affects the water movement, it also influences the upward movement of salts in the xylem.

The simultaneous movement of carbohydrates and fluorescein in opposite directions in the phloem, E. M. PALMQUIST. (Cornell Univ.). (*Amer. Jour. Bot., 25 (1938), No. 2, pp. 97–105, figs. 5*).—Fluorescein applied to the terminal leaflets of red kidney bean (*Phaseolus vulgaris*) entered and moved through the phloem into the lateral leaflets, while dry weight comparisons of the latter clearly indicated that carbohydrates had moved out of the leaf at the same time. Cross sections of the petioles from similarly treated leaves, taken at random intervals, invariably showed fluorescein in the phloem. It is therefore deemed apparent that sugar and fluorescein did not move in opposite directions at alternate periods of time. Fluorescein was also applied to starved terminal leaflets in darkened test tubes, while the laterals were exposed to sunlight and the petiole was scalded. In this case the fluorescein moved out of the terminals, and after 2 days sufficient sugar had entered to produce starch. Cut leaves with starch-filled lateral leaflets and starved terminals were arranged in a dark room with the cut ends of the petioles in water and the tips of the terminal leaflets in fluorescein solution. The latter moved out of the terminals through the phloem into the laterals and part way down the petioles, while sufficient sugar moved out of the laterals and into the terminals to produce starch there. It is concluded that carbohydrates and fluorescein can move simultaneously in opposite directions in the same phloem. If substantiated, this vitiates the idea of a unidirectional mass flow of sieve tube contents. Of the remaining theories of solute transport, the one deemed most satisfactory is that of protoplasmic streaming.

Transformation of sugars in sugar beet and corn leaves and invertase activity, O. A. LEONARD. (Iowa State Col.). (*Amer. Jour. Bot., 25 (1938), No. 2, pp. 78–83*).—Sugars were absorbed through the membranes surrounding the xylem cells, but not through external leaf membranes or through internal membranes of the root cells. The sugar transformations observed to occur in recently matured sugar beet leaf blades and corn leaves, as shown by feeding experiments, are described and diagrammatically represented. The major part of the sucrose absorbed by beet blades was hydrolyzed, but only a small part in corn leaves. This hydrolysis in beet blades was associated with a relatively high invertase activity, while the low hydrolysis of sucrose in corn and also in dandelion blades was associated with a relatively weak activity of this enzyme. These facts confirm the idea that sucrose is hydrolyzed but not synthesized by invertase, and it is suggested that its synthesis is brought about by a sucrose-synthesizing system existing, perhaps, on protoplasmic surfaces.

Fat metabolism in plants, with special reference to sterols, [I], II, P. L. MACLACHLAN (*Jour. Biol. Chem., 113 (1936), No. 1, pp 197–204, fig. 1; 114 (1936), No. 1, pp. 185–191*).—Two papers are included.

In part 1 it was found that (1) while the total fat diminished markedly with the germination of mammoth yellow and black Wilson soybeans, there was continuous synthesis of sterol which was somewhat greater in darkness than in light, and (2) during rapid fat mobilization and utilization there was a notable esterification of the sterol. These results suggest a close relation between sterol and fat metabolism, much the same as in animals.

In part 2, differential changes in the cotyledons and in the roots, stems, and leaves, the total fat of soybean cotyledons diminished markedly with germination, and less notably in darkness than in light. The roots, stems, and leaves synthesized fat equally well in darkness and in light. The fatty acids of the cotyledons did not differ in degree of saturation from those of ungerminated seed, but the newly formed fatty acids of roots, stems, and leaves were considerably more saturated. The marked increase in the sterol of germinating

soybeans occurred mainly in the roots, stems, and leaves of the seedlings. On the other hand, esterification of the sterol occurred chiefly in the cotyledons.

The results suggest a close relation between sterol metabolism and fat utilization in the cotyledons, that is, sterol is believed to be a vital constituent of the roots, stems, and leaves of the young plant.

Leaf temperatures, R. H. Wallace and H. H. Clum. (Conn. State Col. et al.). (*Amer. Jour. Bot., 25 (1938), No. 2, pp. 83–97, figs. 7*).—Tests between June 15 and July 1 on 20 species of woody and herbaceous plants were made by means of thermopiles and recording potentiometers in a reexamination of the problem of leaf temperatures and their significance in the economy of the plant. All species tested were killed when waxed and held normal to the sun, except on cloudy days. Leaf temperatures of 58°–60° C. were common in waxed leaves on days with normal radiation intensitites. In control leaves normal to the sun temperatures were as much as 19.5° above those of the air. The differential between the waxed and control leaves was 6°–9°, indicating a cooling effect of this amount. No conclusions are made regarding the quantitative heating effects of different species, but there seems to be no doubt that transpiration is at times necessary to prevent leaves or leaf parts normal to the sun from becoming injured. Preliminary tests on leaves, stems, and flowers indicated no marked difference in temperature relations of parts.

Examination of the curves presented led to the conclusion "that loss of energy to the sky does not explain the fact that leaves are often below air temperature. Meteorological data indicate that this must be true for the daylight period, since energy receipt from the sky then exceeds the energy loss to the sky. Likewise at night leaves are seldom, if ever, below air temperature due to loss to the sky, since they intercept outgoing earth radiation which will keep them at the temperature of surrounding objects. These conclusions were verified by readings of a total radiation cell."

Effect of light on CO_2 in leaves, J. Shafer, Jr. (Cornell Univ.). (*Plant Physiol., 13 (1938), No. 1, pp. 141–156, figs. 3*).—A method was developed (and is described) whereby gases in a single leaf can be extracted and analyzed for CO_2. From the data thus obtained it is concluded that leaves in light or darkness contain much CO_2, that those in the light contain more, that the CO_2 gas is not entirely or even mainly in the intercellular spaces, that it cannot be held simply in solution, that part of the CO_2 in lighted leaves is held by some light-activated mechanism involving adsorption or loose chemical combination, and that chlorophyll is not concerned with this mechanism.

Light intensity and the nitrogen hunger period in the Manchu soybean, E. B. Fred, P. W. Wilson, and O. Wyss. (Univ. Wis.). (*Natl. Acad. Sci. Proc., 24 (1938), No. 1, pp. 46–52, fig. 1*).—It is concluded that "when nodulated soybeans are grown under sunlight of high intensity, fixation of atmospheric nitrogen is inhibited and the nitrogen hunger stage in the plants is unduly prolonged. The inhibition appears to be associated with an excessive carbohydrate-nitrogen balance in the plant, probably with the relation of soluble forms of carbohydrate and nitrogen. Reduction of this excessive carbohydrate-nitrogen relationship either by shading (decrease in photosynthesis and hydrolysis of protein) or by addition of soluble forms of combined nitrogen is accompanied by initiation of the nitrogen fixation process, followed by a normal development of the plant."

***The effects of temperature and other environmental factors upon the* photoperiodic responses of some of the higher plants**, R. H. Roberts and B. E. Struckmeyer. (Wis. Expt. Sta.). (*Jour. Agr. Res. [U. S.], 56 (1938), No. 9, pp. 633–677, figs. 46*).—The photoperiodic responses in many plants, in-

cluding poinsettia, Klondike cosmos, rudbeckia, soybean, Maryland Mammoth tobacco, and salvia, were found to be altered by temperatures a little above or below those usually employed in greenhouse culture. Morning-glory plants with branches under different photoperiods gave systemic rather than local responses, as has also been the case with poinsettia, cosmos, and tobacco. Orange Flare cosmos, blooming in midsummer, is a variant for temperature rather than photoperiod. The effects of other environal treatments, as well as temperature, indicate that the blossoming state results directly from the nature of the internal condition of the plant, rather than from any specific external treatment. "If, as appears from the responses of several varieties of plants, adaptation is a genetic character, it deserves greater consideration than is now given it in plant-breeding work."

Influence of deuterium oxide on photosynthesis in flashing and in continuous light, R. Pratt and S. F. Trelease (*Amer. Jour. Bot.*, *25 (1938), No. 2, pp. 133–139, figs. 5*).—Previous studies (E. S. R. 78, p. 756) showed that D_2O reduces the rate of photosynthesis. The present study, designed to elucidate the mechanism of this reduction, furnishes direct evidence that D_2O retards the dark-chemical reaction of photosynthesis, but has little if any effect on the photochemical stage. As an important implication of the work, it is noted that H_2O, as well as D_2O, enters into the dark-chemical photosynthetic reaction.

Effects of X-rays on seeds, A. A. Bless. (Univ. Fla.). (*Plant Physiol.*, *13 (1938), No. 1, pp. 209–211*).—Within the limits of X-ray dosage used significant effects on the yield at maturity occurred for lettuce and bean, the response to X-irradiation being greater for sprouted than for dry seed. No significant changes were observed for radish seed exposed sprouted or dry, or for corn exposed dry.

Phytohormones: Structure and physiological activity, I, J. B. Koepfli, K. V. Thimann, and F. W. Went (*Jour. Biol. Chem.*, *122 (1938), No. 3, pp. 763–780*).—The specificity of the growth- (cell-elongation) promoting properties of a number of synthetic substances was determined by simple biological tests, and evidence is presented that the specificity of physiological activity does not necessarily depend on the nucleus of a substance but rather on a particular molecular configuration. The minimum structural requirements for this growth activity in the higher plants as indicated by the results reported are (1) a ring system as nucleus, (2) a double bond in the ring, (3) a side chain, (4) a carboxyl group (or structure readily converted to a carboxyl) on this side chain at least one carbon atom removed from the ring, and (5) a particular space relationship between the ring and the carboxyl group.

A simplified method for auxin extraction, J. van Overbeek (*Natl. Acad. Sci. Proc.*, *24 (1938), No. 1, pp. 42–46, fig. 1*).—The main features of the extraction method described in detail are the omission of acid, avoidance of crushing the material, a single prolonged (overnight) extraction, and evaporation of the ether extract to complete dryness. A formula for calculating the auxin concentration is presented and discussed. The author believes that amounts of auxin extracted from or diffused out of plants should be expressed in absolute rather than in arbitrary units.

Specific factors other than auxin affecting growth and root formation, F. W. Went (*Plant Physiol.*, *13 (1938), No. 1, pp. 55–80, figs. 6*).—Although auxin is necessary for growth in length of stems, apical swellings, and root formation in pea seedlings, the author claims to have shown that it is not the only specific factor involved. The presence of other hormone-like factors ("calines") is required, e. g., without caulocaline, which is formed in the roots, no elonga-

tion of the stem or lateral buds occurs. It is deemed probable that the same factor is necessary for the formation of swellings after treatment of the apical zone of the stem with a high auxin concentration. Rhizocaline, coming from the cotyledons, must be present along with auxin to induce root formation, while phyllocaline is necessary for leaf growth.

Auxin causes a redistribution of the calines in the plant, thus enabling polar root formation and bud inhibition to be further explained. The developmental specificity, i. e., the determination as to whether under auxin influence roots will develop, or growth in length or thickness will occur, is said to depend on the relative concentration of the various calines. The latter, a new group of plant hormones, have thus far not been handled outside of living tissue.

Twenty-eight literature references are included.

Aneurin and the rooting of cuttings, F. W. Went, J. Bonner, and G. C. Warner (*Science, 87 (1938), No. 2251, pp. 170, 171*).—From the results of experiments with etiolated pea stems and leafy lemon cuttings it was found that aneurin (vitamin B_1), the root-growth hormone, if applied at the rate of 1 mg per liter or even less at the appropriate time (in these instances 5 to 9 days and 13 days, respectively) after roots have been initiated by auxin (indoleacetic acid), greatly increased the root development of cuttings and hence may become important in nursery practice.

Transplantation experiments with peas, F. W. Went (*Amer. Jour. Bot., 25 (1938), No. 1, pp. 44–55, figs. 3*).—Until union of grafted peas through junction of the tissues by regenerated vascular bundles, no growth of the etiolated grafted tops occurred. Stem elongation, and leaf, stipule, and petiole growth were differentially affected by the varieties used as rootstocks, the conclusion thus being reached that each of these processes is affected by a different factor or set of factors. These factors, coming from the base and moving only through living tissues, are provisionally placed in a new category of plant hormones, the "calines."

Histological comparison of fruits developing parthenocarpically and following pollination, F. E. Gardner and E. J. Kraus (*Bot. Gaz., 99 (1937), No. 2, pp. 355–376, figs. 17*).—Continuing studies previously noted (E. S. R., 78, p. 761), the development of parthenocarpic holly (*Ilex opaca*) fruits after spraying with indoleacetic acid paralleled amost exactly that following pollination. The chief differences were that the stigma cells of the sprayed fruits proliferated somewhat more and did not collapse and suberize quite so often, and there was a lack of development of an embryo or of endosperm in the ovules. Particularly striking in the parthenocarpic fruits was the disintegration of the megagametophyte, which began about 5 days after spraying and despite the fact that the cells of the integument developed as rapidly and differentiated to the same extent as those of pollinated fruits, at least up to 302 hr. The berries as a whole were as large, turgid, and green in one case as in the other, and in the fall no differences were noted in time of ripening.

Particularly noteworthy was the lack of marked or disorderly cell proliferation in the chemically treated pistils. As in the case of fruits stimulated by pollen, the parthenocarpic fruits developed in a regular manner with swelling of the ovaries through increase in cell number and size, slight stimulation of the stigmatic cells followed by gradual shriveling later, and even normal development of the seed coat over a long period, though no development of endosperm and no traces of embryo were present.

Mitochondria and plastids in living cells of Allium cepa, H. Sorokin (*Amer. Jour. Bot., 25 (1938), No. 1, pp. 28–33, figs. 11*).—"The available evidence indicates that there are two categories of self-perpetuating bodies—i. e.,

mitochondria and plastids, which may be differentiated in uninjured living cells by their reactions towards Janus green B."

A measure of toxicity in plant studies, P. L. Gile. (U. S. D. A.). (*Jour. Agr. Res.* [*U. S.*], *56* (*1938*), *No. 10, pp. 787–789, fig. 1*).—It is suggested from this study that the toxicity of a compound for a plant be measured by the concentration required to reduce growth one-half. This measure can be determined accurately and is independent of the marked differences in light and temperature occurring in an ordinary greenhouse between summer and winter.

GENETICS

Chromosomes of maize from North American Indians, A. E. Longley. (U. S. D. A.). (*Jour. Agr. Res.* [*U. S.*], *56* (*1938*), *No. 3, pp. 177–195, figs. 13*).—Examination of the chromosomes of 33 strains of corn grown by 33 tribes of American Indians disclosed several knobs and an abnormal type of chromosome X not found in improved corn varieties. Very few knobs were found on the chromosomes of the corn of the northern tribes, a slightly higher number of knobs on the chromosomes of corn from Indian tribes of the Southeast, and many knobs on the chromosomes of practically all the corn from the Indians of Arizona and New Mexico. The number of knobs on the chromosomes of the corn of the Indians of the United States appeared to increase as the tribes were closer to Mexico, where the much-knobbed chromosomes of corn and its relatives occur. B-type chromosomes, although prevalent in most strains studied, were found more frequently in plants with less than seven knobs than in plants with more than seven knobs on their chromosomes.

Preferences for certain genetic strains of corn exhibited by animals, E. Roberts, J. R. Holbert, and J. H. Quisenberry. (Ill. Expt. Sta. and U. S. D. A.). (*Jour. Amer. Soc. Agron.*, *30* (*1938*), *No. 2, pp. 150–159, figs. 4*).—Feeding trials using genetically different strains of corn suggested very definitely that both mice and rats show a preference for certain strains. One observation with swine also indicated a distinct preference.

Inheritance of resistance to loose and covered smuts in oat hybrids, G. M. Reed and T. R. Stanton (*Jour. Amer. Soc. Agron.*, *29* (*1937*), *No. 12, pp. 997–1006*).—Pursuant to studies in the F_2 and F_3 progenies of eight oat hybrids involving contrasting reactions, a high degree of susceptibility occurred in both sets of progenies in two crosses in which both parents were susceptible to *Ustilago avenae*. One parent of each of these two hybrids was resistant to *U. levis*, while the other parent was susceptible, and the data for both F_2 and F_3 indicated a monohybrid inheritance for resistance to covered smut. In five crosses in which one parent (Monarch) was susceptible to covered and resistant to loose smut and the other five parents were the reverse in reactions, the data for F_3 indicated clearly that resistance to the two smuts is inherited independently. These hybrids have given rather low percentages of infection with loose smut in the F_2, and in most of them there was also a shortage of resistant F_3 progenies. There appears to be much evidence that the inheritance of resistance to these smuts in the hybrids in question is controlled by distinct single factors. In an additional cross, Danish Island × Monarch, in which the former was very susceptible to loose smut and only slightly so to covered smut, a single-factor relationship for resistance to loose smut, with resistance dominant, was also indicated. On the other hand, in the inheritance of resistance to covered smut, susceptibility appeared to be dominant.

Sorghum characters grouped by multiple correlations, J. C. Ireland. (Okla. Expt. Sta.). (*Jour. Agr. Res.* [*U. S.*], *56* (*1938*), *No. 9, pp. 707–710*).—Thirteen of the heritable characters of grain sorghums suggested as sources

of linkage groups were used, 1929–36, for determining their practical value for indicating yields, the approach being from a multiple correlation basis, and employing Blackhull, a white-seeded grain sorghum, crossed with Japonica, an amber-seeded sorgo. Whether yields could be predicted accurately from the numbers of values indicated in these studies seemed doubtful, especially in seasons of subnormal rainfall. Irregular results obtained in 4 of the 8 yr. showed that moisture and temperature have much to do with the correlation values.

"A basis for inheritance studies may be found in three groups of values shown in this paper: (1) Length of plant and plant parts (head and seed branches); (2) photosynthetic agencies, such as leaf area, chlorophyll, and sugar content; and (3) number of leaves and nodes."

Recent studies on the genetics of the soybean, C. M. WOODWORTH and L. F. WILLIAMS. (Ill. Expt. Sta. and U. S. D. A.). (*Jour. Amer. Soc. Agron., 30 (1938), No. 2, pp. 125–129, fig. 1*).—New chlorophyll-deficient types studied in soybeans included y_4, a yellowish-green type; y_5, a greenish-yellow type; y_6, a pale-green type; y_7, a distinct yellowing on leaves, stems, pods, and seeds, all apparently simple recessives to normal; and y_8, not fully studied but characterized by yellow-green leaves in the young plant. Other characteristics and genetic behavior of these new types are described briefly. New linkage relationships indicated from recent studies are described, and gene orders are indicated on a provisional soybean chromosome map.

Meiotic instability as an inherited character in varieties of Triticum aestivum, W. M. MYERS and L. POWERS. (Minn. Expt. Sta. and U. S. D. A.). (*Jour. Agr. Res. [U. S.], 56 (1938), No. 6, pp. 441–452*).—Occurrence of chromatin loss, determined from the percentage of immature microspores showing micronuclei, was used to measure meiotic irregularity in studies of Marquis, Thatcher, D. C. 2305, H–44, and Supreme wheat. These varieties differed significantly in percentage of micronuclei in 1931. Progeny tests of individual plants during 3 yr. indicated that heritable differences in meiotic instability occurred. Lines differing significantly in percentage of micronuclei were isolated in Marquis and in H–44. Some lines appeared to be homozygous in 1936. Indications were that genetic factors were involved in conditioning meiotic instability. The failure to isolate lines homozygous for high meiotic instability suggested that structural differences of the synapsing chromosomes may also have been involved. The significant differences in percentage of micronuclei found between different dates of collection of microsporocytes in 1936 suggested an effect of environment on meiotic irregularity.

The inheritance of pericarp tenderness in sweet corn, I. J. JOHNSON and H. K. HAYES. (Univ. Minn.). (*Jour. Amer. Soc. Agron., 30 (1938), No. 3, pp. 220–231, figs. 3*).—Using as a measurement the puncture test, studies were made of the inheritance of pericarp tenderness in a cross between a very tender, open-pollinated variety and a tough pericarp Crosby inbred line. The F_1 was practically intermediate between the two parents in puncture-test value and in coefficient of variability. In the F_2, segregation occurred with a coefficient of variability greater than that of the F_1 and of the tender parent. In the F_3 and in first-year selfed lines from backcrosses to the tender parents, lines were obtained with as low a coefficient of variability as that of the inbred tough pericarp parent. The recovery of relatively pure lines having an average puncture-test value in the classes intermediate between the parents suggested that several factor pairs condition pericarp tenderness. Results of the backcrosses to the tough pericarp parent indicated that genes for pericarp tenderness from the tender parent had been carried successfully in a heterozygous condition. In

backcrosses to the tender parent, almost complete recovery of the genotype of the tender parent was secured in the second backcrossed generation.

A genetic analysis of the inheritance of fragrance of gladiolus, F. T. McLean (*Bul. Torrey Bot. Club, 65 (1938), No. 3, pp. 181–197*).—A study of the progeny obtained from reciprocal crosses indicated that the lilylike night fragrance of *Gladiolus tristis* and the violetlike fragrance of *G. recurvus* are inherited differently. The violet of *G. recurvus* was dominant and apparently was determined by two factors, both of which may be heterozygous. In addition, two new types of fragrance, each more pronounced than the primary species types, were found in the F_2 generation and are designated as lemon-scented and pungent-scented. Certain apparent cases of linkage between fragrance and flower form and flower color and leaf color are reported.

A cytological and morphological analysis of tomato species, L. M. Humphrey. (Iowa State Col.) (*Cytologia, 8 (1937), No. 2, pp. 306–318, figs. 27*).—Studies of *Lycopersicum esculentum* and *L. pimpinellifolium* and their hybrid showed certain well-marked differences, chiefly of a quantitative character. Pollen size, chromosome size and volume, both somatic and meiotic, size of cell and nucleus in root tips, and size of stoma were significantly smaller in *L. pimpinellifolium*. Chromosome behavior was normal in both species, and the hybrid behaved normally except for certain constant weaknesses of pairing at pachytene and a much reduced chiasma number throughout. Flower parts were constantly five in *L. pimpinellifolium*, but varied in *L. esculentum*, with six or seven as the usual number. The F_1 resembled more closely the *L. pimpinellifolium* parent, indicating a dominance of genetic characters in the wild parent.

The relation of the first chromosome pair to date of fruit ripening in the tomato (Lycopersicum esculentum), T. M. Currence (*Genetics, 23 (1938), No. 1, pp. 1–11, figs. 2*).—Evidence is presented as to the location on the first chromosome of certain genes that affect the time of ripening of the tomato fruit. Altogether, chromosome 1 was found to have an effect of approximately 19 days on the time of fruiting. The effect of different parts of the chromosame on earliness was not found related to cross-over lengths of the regions. A tetraploid F_3 population appeared to be more variable for earliness than a comparable diploid population, but increasing the number of chromosomes containing earliness genes did not produce earlier plants.

A genetic study of Tropaeolum, W. G. Whaley and A. P. French (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 598–602, figs. 2*).—Observations are presented on the F_1 and F_2 generations from crosses of Golden Gleam (*T. majus*) with *T. peltophorum fimbriatum*. The lobed type of leaf was definitely recessive to the simple type. Dark green leaf color was apparently dominant over medium green, and in turn medium over light green. Red color in the stems was dominant over green. As to flower color, A_n, representing the gene for red, with a_n, its allel, more or less obscured the expression of Y and Y', duplicate genes for dark yellow, and y and y' as their respective allels for pale yellow. Two new linkages were determined involving red stem and red flower color in the coupling phase and nonlobed leaf with rounded petal types.

* **Sex in the genus Vitis** [trans. title], H. Breider and H. Scheu (*Gartenbauwissenschaft, 11 (1938), No. 5, pp. 627–674, figs. 12*).—Through extended studies of the flowers of varieties and clons, the authors established the fact that sex expression in *V. vinifera* may be influenced by external conditions. In wild *vinifera* stocks there were observed only two sexes, namely, male heterozygous XY and female homozygous XX. Most of the mixed sex forms of *V. vinifera* are genotypically male and possibly homozygous YY or heterozygous XY. It is suggested that there are also hermaphroditic forms in *V. vinifera*

that are genotypically female. Sex expression in hybrids of *V. vinifera* × *V. riparia* was on the basis of simple Mendelian factors. In hybrids of *V. vinifera* × *V. rupestris*, sex expression in some of the hybrids followed a simple Mendelian ratio and others a polyfactorial basis. The *Y* chromosome is believed to bear the sex-determining factors, with the *X* chromosome taking no part in sex determination. The findings were corroborated in backcrosses of the species hybrids to the *vinifera* parent.

[Papers on animal genetics, physiology of reproduction, and lactation] (*Amer. Soc. Anim. Prod. Proc., 30 (1937), pp. 55–58, 64–70, 137–145, 196–205, 230–238, 259–324, figs. 2*).—Brief reports were presented on the following subjects before the American Society of Animal Production (E. S. R., 77, p. 466): How the Endocrine Glands Regulate the Productive Ability of Dairy Cattle, by C. W. Turner (pp. 55–58); Estrus and Ovulation in the Mare: A Preliminary Report, by F. F. McKenzie and F. N. Andrews (pp. 64–70); The Pituitary and Thyroid in Relation to Sperm Production in Rams, by V. Berliner and V. Warbritton (pp. 137–142); Sperm Survival in the Genital Tract of the Ewe, by V. Warbritton, F. F. McKenzie, V. Berliner, and F. N. Andrews (pp. 142–145); The Minnesota Studies of Crossbreeding Swine, by L. M. Winters, P. S. Jordan, O. M. Kiser, and R. E. Comstock (pp. 196–203); The Extension Application of Crossbreeding of Swine, by H. G. Zavoral (pp. 204, 205); Conference on Artificial Insemination, by R. W. Phillips (pp. 230–233); A Study of Characteristics of Normal and Abnormal Semen of the Sheep, by R. E. Comstock and D. E. Brady (pp. 233–238); Artificial Insemination of Ewes, by C. E. Terrill and E. M. Gildow (p. 238); A Factor in Breeding Efficiency of Dairy Cattle, by H. Clapp (pp. 259–265); What the Cattle Breeder Would Ask the Geneticist, by O. V. Battles (pp. 265–271); The Desirability of Carcass Standards of Performance, by H. R. Davison (pp. 272–277); Disease as a Problem in Animal Production, by F. E. Mollin (pp. 277–286); What Can Science Do [in Solving Genetic Problems]? by G. H. Hart (pp. 286–290); The Importance of Threshold Characters in Animal Breeding, by L. J. Cole (pp. 291–296); The Relation of Type and Time of Birth and Birth Weight of Lambs to Their Survival, Growth, and Suitability for Breeding, by R. W. Phillips and W. M. Dawson (pp. 296–306); Certification of Pedigrees of Imported Registered Livestock, by J. R. Mohler (pp. 306–310); Measurement of Reproductive Capacity as an Aid in Selection of Rams of High Fertility, by C. E. Terrill (pp. 311–316); and The Possibility of Establishing Within Breeds Lines of Sheep That Are Genetically Resistant to Stomach Worms, by P. W. Gregory (pp. 316–324).

Genetic history of cattle in Wisconsin, G. W. Woolley (*Wis. Acad. Sci., Arts, and Letters, Trans., 30 (1937), pp. 131–178, figs. 5*).—Essentially a history of cattle breeding in Wisconsin.

Inheritance of mammae in swine, a character involving partly symmetrical organs, M. Plum (*Hereditas, 24 (1938), No. 1–2, pp. 216–230, figs. 3*).—In 1,523 Danish Landrace pigs the numbers of mammae were equal on both sides in 64.5 percent of the cases, although in a few they were not paired. Significant differences in the percentage of animals from different breeding centers showed asymmetrical placement of mammae, and other data suggested that the asymmetry was hereditary. Analysis of data involving matings of two boars with four sows by methods of diallel crossing, and correction for symmetry suggests that the number of mammae behaves as a typical quantitative character.

A case of non-disjunction in the fowl, F. A. E. Crew (*Roy. Soc. Edinb. Proc., 53 (1932–33), No. 2, pp. 89–103, pls. 2, figs. 7*).—A case of nondisjunction

in an exceptional gold cock was proved by both cytological and genetic evidence to be of the composition (sX) $(sX)Y$.

Studies on the physiology and inheritance of feathering in the growing chick, M. H. RADI and D. C. WARREN. (Kans. Expt. Sta.). (*Jour. Agr. Res.* [*U. S.*], *56* (*1938*), *No. 9*, *pp. 679–705*, *figs.* 7).—Continuing the studies of the influence of various conditions and genetic factors on feathering in broilers (E. S. R., 78, p. 31), studies were made on the rate of feathering of approximately 3,100 birds in 3 strains of Rhode Island Reds referred to as early-feathering, well-feathering, and poor-feathering. In the well-feathering and poor-feathering strains, feather growth was scored at from 7 to 8 weeks of age. In the well-feathering and poor-feathering strains it was found that vitamin A and various grains had little, if any, significant effect on feathering. However, feather development was stimulated by thyroxine, high humidity, and low brooding temperature. There was a marked sex difference in rate of feathering in that females feathered at an earlier age than males. The length of the primary wing feathers at hatching did not seem to be related to the 8-week feathering condition, although low but significant correlations were found between the feathering at from 7 to 8 weeks of age and the number of primary wing feathers at hatching and the length of the wing in relation to the body at 13 days of age. Thyroxine and iodine produced some improvement in feathering. Selection within the well-feathered and poor-feathered lines was effective in segregating strains differing genetically for rate of feathering. In crosses between these strains, well-feathering seemed incompletely dominant to poor-feathering and was autosomal, whereas early feathering as occurs in Single Comb White Leghorns is sex-linked and recessive. It is suggested that the genetic differences within the well-feathering and poor-feathering lines were probably due to modifying factors acting upon the sex-linked dominant late-feathering gene.

Inherited congenital baldness in the domestic fowl, R. G. JAAP. (Okla. Expt. Sta.). (*Okla. Acad. Sci. Proc.* [*Okla. Univ.*], *17* (*1937*), *pp. 41–43*).—Some parents produced larger percentages of progeny with spots on the head devoid of feathers than were produced by other parents. Although probably hereditary, the condition was not the result of the action of a single pair of recessive genes.

Preliminary report of crossbreeding for broiler production, W. R. HORLACHER and R. M. SMITH (*Arkansas Sta. Bul. 354* (*1938*), *pp. 16*, *figs. 5*).—Data are presented on the weekly weights to broiler age (12 weeks) of chicks produced by purebred Rhode Island Reds, White Wyandottes, White Leghorns, White Rocks, and Barred Rocks; and crossbred chicks from Rhode Island Red ♀ × White Wyandotte ♂, White Leghorn ♀ × Dark Cornish ♂, and Barred Rock ♀ × White Rock ♂, and reciprocal crosses between White Wyandottes and White Rocks. The hybrids of only one cross, Rhode Island Red ♀ × White Wyandotte ♂, were clearly superior to both parental breeds by being heavier and requiring less feed per unit of gain up to broiler age. These crossbreds were white with a few black feathers and some black flecks in the white feathers. The Barred Rock ♀ × White Rock ♂ hybrids grew well but not significantly better than White Rocks, although they utilized feed better than either of the parental breeds. Variations were noted in the other crossbreds, but no barebacks occurred in the Rhode Island Red ♀ × White Wyandotte ♂ crossbreds.

The sex ratio in the cross of Phasianus torquatus ♀ × Gallus domesticus ♂, G. C. SANDNES and W. LANDAUER. ([Conn.] Storrs Expt. Sta.). (*Amer. Nat.*, *72* (*1938*), *No. 739*, *pp. 180–183*).—Among 135 sexed hybrids produced by crossing pheasant hens with Creeper and White Leghorn roosters by artificial

insemination, there were produced 66 males and 69 females. The results of other workers seemed to indicate an excess of male hybrids from the reciprocal cross. Differences in the sex ratio of hybrids from reciprocal crosses are discussed and are usually explained as due to differential sex mortality or sex reversal. Although pronounced differences in the ratio of the sexes were not observed in the pheasant hen × the rooster cross, attention is called to the occurrence of heavy mortality during the first week of incubation.

Biological standardization, J. H. BURN (*London: Oxford Univ. Press, 1937, pp. XVIII+288, figs. 64*).—Methods of assaying various biological products are presented, especially the extracts of the endocrine glands and vitamins.

Studies in fertility of sheep, R. B. KELLEY (*Austral. Council Sci. and Indus. Res. Bul. 112 (1937), pp. 67, pl. 1, fig. 1*).—Observations are reported on ovulation, oestrus, mating, and gestation in over 300 ewes which showed that ovulation takes place after or in the last stages of oestrus. The ovum travels rapidly through the upper third of the fallopian tube, remains approximately 50 hr. in the middle third, and reaches the uterus by about 70 hr. after the cessation of the heat period. The rate of travel of spermatozoa is approximately 1.26 mm per minute in the genital tract. The fertilizing power of sperm was lost approximately 34 hr. after copulation. The modal period of gestation was 148 days.

The reproductive organs and semen of the boar, F. F. MCKENZIE, J. C. MILLER, and L. C. BAUGUESS. (Coop. U. S. D. A.). (*Missouri Sta. Res. Bul. 279 (1938), pp. 122, figs. 37*).—Descriptions are given of the size, characteristics, and histology of the reproductive organs of 13 Chester White and Duroc-Jersey boars. Semen samples were obtained by the methods of McKenzie [1] from normal boars and from boars from which the seminal vesicles, and/or Cowper's glands, and/or portions of the prostate were removed. The volume of semen per ejaculate from a normal boar ranged from 125 to 500 cc, with a sperm concentration of from 25,000 to over 1,000,000 per cubic millimeter. Sperm concentration and number were high in the first collection following sexual inactivity. The duration of ejaculation ranged from 3 to 25 min. in different boars, but the rate was more rapid during the first 3 min. and showed cyclic behavior. Repeated ejaculations at intervals of 24 hr. or less reduced the volume of semen and the concentration of sperm, reduced the duration of sperm motility, and increased the presence of abnormal forms of sperm. Extreme sexual activity produced sperm with a cytoplasmic cap. Removal of the accessory sex glands (seminal vesicles and Cowper's glands) did not affect libido or reduce fertility, but the quantity and character of the semen was modified. It lacked the gelatinous material and was generally more watery. It was estimated that the seminal vesicles contribute from 15 to 20 percent of the semen volume; Cowper's glands, from 10 to 25 percent; the epididymides, from 2 to 5 percent; and the prostatic and urethral glands, from 55 to 70 percent. The chemical constituents of the secretions of the different glands were ascertained.

Reproduction in the silver fox, I. JOHANSSON (*Lantbr. Högsk. Ann. [Uppsala], 5 (1938), pp. 179–200, figs. 12; Swed. abs., pp. 199, 200*).—An analysis of breeding records from 116 Swedish fox ranches, based on 2,035 females, showed that reproduction was only about 55 percent of what it might have been had all females produced and raised litters averaging 4.5 young, which was the average size of 793 litters produced during the life of 361 vixens on 24 farms. The relation of age of vixen and month of birth to litter size and survival was tabulated. The average duration of 587 pregnancies was 51.99±0.036 days. The data from 116 farms showed an average of 3.1 females mated with each male. Descrip-

[1] Jour. Amer. Vet. Med. Assoc., 78 (1931), No. 2, pp. 244–246, fig. 1.

tion is given of the condition of the ovaries and other genital organs of 12 vixens killed shortly after mating or in a stage of pseudopregnancy. Eight of the 9 pseudopregnant vixens had never shown heat symptoms, but they had well-developed *corpora lutea*. Spermatozoa were found in the tubal end of the uterine horns in 2 foxes within 15 min. after mating, but ovulation had not yet occurred.

Studies on the reproductive system in the guinea-pig: Variations in the oestrous cycle in the virgin animal, after parturition, and during pregnancy, T. Nicol (*Roy. Soc. Edinb. Proc., 53 (1932–33), No. 3, pp. 220–238, fig. 1*).—An analysis of 368 oestrous cycles from 40 virgin and pregnant guinea pigs.

A review of the literature on embryonic malpositions and their effect on hatchability, M. O. North (*U. S. Egg and Poultry Mag., 44 (1938), No. 4, pp. 224–227, 240, 242, fig. 1*).—Papers on the literature on the embryonic malpositions in the fowl are reviewed.

FIELD CROPS

[Field crops research in Arkansas], M. Nelson, C. K. McClelland, L. C. Kapp, H. R. Rosen, L. M. Weetman, E. L. Nielsen, C. R. Adair, J. W. Jones, L. M. Humphrey, B. P. Johnson, C. H. Wadleigh, J. R. Cooper, and V. M. Watts (*Arkansas Sta. Bul. 351 (1938), pp. 11–20, 23–28, 28–36, 55–57, 58, 63, fig. 1*).—Experiments with field crops (E. S. R., 76, p. 617) at the station and substations reported on briefly included variety trials with cotton, corn, wheat, oats, rye, barley, rice, grain sorghum, and sorgo; breeding work with cotton and rice; fertilizer trials with cotton (formulas, rates, and nitrogen carriers), rice, potatoes, and sweetpotatoes; winter hardiness and seed treatment experiments with oats; cultural (including planting) tests with corn, oats, rice, and potatoes; residual effects of summer legumes and winter cover crops on subsequent cotton yields; study of metabolism of the cotton plant; interplanting of legumes in corn and effects on yields of the succeeding crop of oats and cotton; control of rice weeds; rice yields following corn, cotton, and soybeans and response of these crops to irrigation; crop rotations for rice; winter cover crops for rice; effects of manganese and other elements on rice grown in nutrient solutions; cotton fiber investigations, including the development of methods of sorting fibers as to length by a photoelectric cell and of field sampling, and the measurement of fibers of varieties of cotton; and pasture studies.

[Agronomic experiments in Connecticut] (*Connecticut [New Haven] Sta. Bul. 409 (1938), pp. 305, 307, 308, 311, 312, 314, 315, 316–318*).—Fertilizer tests with sweetpotatoes and potatoes, the relative merits of hybrid seed corn for grain and silage, genetic changes in seed of corn during development, and effects of inbreeding corn for many generations, and research at the Tobacco Substation (see p. 328) including tests of RC, a new type of tobacco designed for wrappers but not shade-grown, are again reported on briefly (E. S. R., 77, p. 614).

[Field crops work by the Storrs Station] (*[Connecticut] Storrs Sta. Bul. 221 (1937), pp. 9–14*).—Reports are made again (E. S. R., 77, p. 473) on experiments dealing with the effects of time and frequency of cutting alfalfa under different fertilizer treatments; the effects on alfalfa of amount and depth of application of limestone; the effects of fertilizer treatments on the soil, flora, and production of permanent pastures; response of pasture species to plant

nutrients; the adaptability of varieties and species of grasses and clover for pastures; causes of fluctuations in the prevalence of white clover; and fertilizer experiments involving lime and magnesia and rye green manure with potatoes.

[**Field crops work in Maryland**], J. E. METZGER and F. S. HOLMES (*Maryland Sta. Rpt. 1937, pp. XVIII–XX, XXXVIII–XLI*).—A brief report is made of accomplishments of crop production research (E. S. R., 74, p. 625) with wheat, alfalfa, soybeans, clovers, sweetclovers, and turf and pasture grasses; improvement of winter barley and other small grains; and an account of the value of agricultural seed planted each year in Maryland and of the weed seeds occurring in red clover in Maryland.

[**Agronomic research in New Jersey**] (*New Jersey Stas. Rpt. 1937, pp. 30–33, 48, 49, 78, 79*).—Reports of progress are again made on field crops work (E. S. R., 77, p. 473), including breeding work with corn, alfalfa, and white clover; variety tests with corn, wheat, oats, barley, rye, alfalfa, and red clover strains; tests of a double cropping system which involves winter barley and soybeans in 1 yr. in alternation with cultivated crops, such as potatoes, tomatoes, or vegetables; fertilizer tests with potatoes; increasing the protein content of timothy by nitrogen fertilization at heading or earlier; pasture experiments, including comparisons of 22 seeding mixtures in conjunction with 8 types of soil treatment, and a comparison of the lime-minerals-clover system of pasture treatment with the lime-minerals-nitrogen system; pasture fertilization in relation to carrying capacity, sod improvement, and herbage changes; pasture management in relation to cultural practices, intensity of grazing, and nitrogen fertilizers; experiments on establishing and maintaining turf, including studies on the rate of penetration of lime; and experiments with winter green manures.

[**Agronomic research in South Carolina**], H. P. COOPER, R. W. WALLACE, R. L. SMITH, J. B. EDMOND, G. M. ARMSTRONG, C. C. BENNETT, B. S. HAWKINS, C. S. PATRICK, E. D. KYZER, T. M. CLYBURN, J. H. MITCHELL, J. E. LOVE, E. E. HALL, F. M. HARRELL, W. H. JENKINS, J. D. MCCOWN, W. M. LUNN, J. R. MATTISON, H. A. MCGEE, N. MCKAIG, JR., W. A. CARNS, A. B. BOWEN, J. M. JENKINS, JR., J. J. MIKELL, and W. C. BARNES. (Partly coop. U. S. D. A.) (*South Carolina Sta. Rpt. 1937, pp. 24–29, 30–40, 47, 48, 73–78, 79, 80, 86–88 89–95, 102–106, 108–112 117, 118, 120, 127–130, 135–138, 140–144, 148–150, 151, 152–154, figs. 8*).—Field crops experiments (E. S. R., 77, p. 39), again reported on briefly from the station and substations, included variety tests with cotton, corn, oats, wheat, barley, grain sorghum, sorgo, sugarcane, cowpeas, soybeans, and potatoes; tests of perilla and chia; breeding work and genetic studies with cotton and potatoes; hybridization experiments with sea-island and upland cotton; fertilizer experiments with potatoes, soybeans, and kudzu; fertilizer and nutrition studies with cotton comprising placement, time and rate of applying potassium fertilizers, and trials of potash carriers with and without lime and magnesium sulfate; effects of winter legume cover crops on cotton following, with and without sodium nitrate applications; the comparative value of a cover crop of rye and hairy vetch, fresh manure, and a cover crop plus manure in the production of cotton; studies of variation in fiber length, fineness, and maturity in several cotton varieties; tobacco investigations, including trials of fertilizer mixtures and placement, fertilization of plant beds, effects of various rotations and of fertilizers containing different forms of sulfur, calcium, magnesium, and boron on yield and quality, rates and forms of potash fertilizers, kerosene v. a coal stoker in curing tobacco, a topping and spacing experiment, and fertilizer formulas again recommended for bright flue-cured tobacco and plant beds; the effect on soybeans, velvet beans, and cowpeas of a high-nitrogen fertilizer and a low-nitrogen fertilizer supplemented by a green manure crop

effects of frost injury to potatoes; experiments in sweetpotato sprout production dealing with the influence of sand and loam, shallow and deep bedding, warm and cold water, small v. medium roots, the influence of lengthwise cutting of roots, and production of sprouts by strains and individual roots of the Porto Rico variety; effects of certain chemicals on yields and cracking of sweetpotatoes; a comparison of Biloxi soybeans, Otootan soybeans, and cowpeas for hay; and effects of superphosphate, basic slag, and potash on the growth and composition of carpet grass.

[Field crops experiments in Washington], E. G. Schafer, O. E. Barbee, O. A. Vogel, E. F. Gaines, W. Hermann, M. Schleichendal, D. C. Smith, E. F. Burk, W. J. Clore, H. P. Singleton, C. E. Nelson, and C. A. Larson. (Partly coop. U. S. D. A.). (*Washington Sta. Bul. 354 (1937), pp. 13–19, 45, 63, 64, 65–67, 69–71*).—Experimentation with field crops (E. S. R., 77, p. 325), reported on from the station and substations, included variety tests with spring and winter wheat, barley, oats, rye, corn (and hybrids), seed flax, alfalfa and sweetclover, and mixtures of forage crops; breeding work with barley, oats, wheat, potatoes, and forage grasses; resistance of wheat to physiologic forms of bunt; cultural (including planting) studies with crested wheatgrass and wheat; adaptability of strawberry clover to salinity; reclamation of saline soils; fertilizer tests with alfalfa and with potatoes, corn, and wheat in rotation; crop rotations; behavior of wheat on summer fallow v. pea land; and weed control experiments.

Inoculation for legumes, A. W. Hofer and J. K. Wilson (*New York State Sta. Circ. 179 (1938), pp. 12, figs. 4*).—A practical discussion of the merits of inoculation for legumes, types of and methods of using inoculants, and benefits to be expected from proper and adequate inoculation.

Artificial reseeding on oak-brush range in central Utah, R. Price (*U. S. Dept. Agr. Circ. 458 (1938), pp. 19, pls. 6, fig. 1*).—Artificial reseeding trials were conducted by the Great Basin branch of the Intermountain Forest and Range Experiment Station at three elevational experimental areas on a typical oak-brush range in central Utah. The observations and measurements, 1928–35, of plantings showed that crested wheatgrass was more vigorous at lower elevations and smooth and mountain bromes thrived better at the higher elevations of oak-brush ranges. Slender wheatgrass did well at all areas, whereas the white and yellow sweetclovers failed except in swales where soil moisture was above average. Best stands on all plantings were obtained by broadcasting seed on plowed furrows at 3-ft. intervals and covering with a brush drag. Broadcasting on unprepared ground with or without subsequent trampling by sheep produced fair to good stands. Good stands were obtained from both spring and fall seedings when precipitation after planting was normal or above.

Cooperative experiments in pasture improvement, D. R. Dodd (*Ohio Sta. Bimo. Bul. 191 (1938), pp. 39–47, figs. 3*).—Fertilizer and liming tests on pasture, made 1931–37, in cooperation with numerous farmers in eastern and southern Ohio seemed to provide much evidence to justify the general improvement of adapted permanent pasture lands. The use of lime and phosphate at regular intervals on permanent pastures is suggested as a definite and regular farm practice. Where more pasture is needed than results from the use of lime and minerals, as may appear on intensive dairy farms, the use of nitrogen in rather liberal quantities appeared to be warranted. A summary of production with equivalents in ewe and lamb grazing days, meat and milk, and returns per acre is tabulated, and the effect of white clover content on herbage, yield, and possible returns is discussed.

Clovers and grasses for hay and pasture, C. A. Mooers (*Tennessee Sta. Bul. 165 (1938), pp. 71, figs. 17*).—The characteristics, cultural and fertility requirements, utilization for hay, pasture, soil improvement, or as a seed crop, and their relative merits are shown for true clovers, lespedezas, alfalfa and other Medicagos, and native and introduced grasses grown or tested by the station. Clover-and-grass mixtures are indicated for temporary and permanent pastures and for meadows. Information also is included on pasture management, grazing of seasonal and permanent pastures, and meadow and pasture weeds and their control.

The relation of growth to the varying carbohydrate content in mountain brome, E. C. McCarty (*U. S. Dept. Agr., Tech. Bul. 598 (1938), pp. 24, figs. 6*).—A detailed field and laboratory study was made, 1932–34, at the Great Basin branch (at an elevation of 8,850 ft. in Ephraim Canyon, Utah) of the Intermountain Forest and Range Experiment Station to determine the character of growth and the time and amount of carbohydrate food storage in mountain brome grass (*Bromus carinatus*), a highly palatable range forage grass native to a large part of western mountain range lands. Growth measurements and chemical analyses of plant material showed that, except for acid-hydrolyzable hemicellulose, carbohydrate storage in mountain bromegrass is related inversely to the rate of growth of the herbage, i. e., high growth rate, low carbohydrate storage. Minimum values were observed to prevail in the roots and stem bases during the active growth stages of the plant. Maximum storage occurs during the autumn period after current seasonal and secondary herbage growth is completed. Minimum carbohydrate values in roots and stem bases occur shortly after snow disappears, showing that annual herbage growth is a product of carbohydrates manufactured currently. High concentration of sugars in the basal organs and in newly developed shoots were associated with low temperatures. Sugars and starches (chiefly sucrose and starch) appeared to be the more potent of the stored carbohydrates, while the behavior of the hemicellulose fraction suggested that this carbohydrate is employed largely as structural material. The results are held to reemphasize the importance of moderate and regulated grazing use of grasses to allow for proper growth and carbohydrate storage.

Four pasture clovers, A. R. Midgley (*Vermont Sta. Bul. 431 (1938), pp. 16, pls. 8*).—Natural wild white clover outranked common white Dutch, Ladino, and English white wild clovers in respect to persistence and longevity when the four clovers, variously fertilized, were compared as to usefulness for pasture purposes. Its growth, when properly fertilized, increased as time passed, while that of the others decreased. Its stand continued to improve, and after three seasons a dense turf covered all plats on Woodbridge loam, Addison clay loam, and Berkshire stony loam soil types and even began to supersede the other clovers. It was noted that the English type both needs and withstands close grazing. Ladino, being a more erect type, disappeared quickly when grazed closely, but succeeded better when less closely eaten. It outyields the other clovers while it lasts. In growth habits the white Dutch was intermediate between the English and Ladino types.

Natural wild white clover, it is pointed out, succeeds best on moist, rather heavy and not too acid soils with high organic matter and mineral contents. Close grazing and repeated usage of minerals are important in establishing and maintaining a wild white clover pasture. Since early grazing checks grass growth and gives clover a better chance, changing the grazing method makes it possible to establish either a clover-dominant or a grass-dominant pasture. Ample supplies of minerals are indicated since clovers use much phosphoric acid and potash (E. S. R., 75, p. 619). Although little nitrogen is needed, a

small amount sometimes will aid the crop in getting established on poor soils. Nitrogen may well be used on the rotational or meadow type of pasture where early cut hay or grass silage are sought as well as a good aftermath, but not upon permanent pasture where wild white clover is grown.

Data and notes on certified corn hybrids for Ohio, G. H. STRINGFIELD. (Coop. U. S. D. A.). (*Ohio Sta. Bimo. Bul. 191 (1938), pp. 29–38, fig. 1*).—Essential comparative data taken before 1937 are presented, and brief descriptive notes are given on the leading corn hybrids indicated for Ohio.

Hopi cotton, a variable species, H. J. FULTON. (U. S. D. A.). (*Jour. Agr. Res. [U. S.], 56 (1938), No. 5, pp. 333–336, figs. 2*).—Hopi cotton (*Gossypium hopi*) (E. S. R., 30, p. 37), formerly grown by the southwestern Indians, according to studies at Sacaton, Ariz., is heterozygous and capable of modification by selection. Certain progenies isolated have bred true for each character of the allelomorphs yellow and white corollas, yellow and cream-colored pollen, and smooth and pitted bolls.

The origin of lint and fuzz hairs of cotton, A. G. LANG. (U. S. D. A. and N. C. Expt. Sta.). (*Jour. Agr. Res. [U. S.], 56 (1938), No. 7, pp. 507–521, figs. 3*).—The time and place of origin of lint and fuzz hairs in the ovules of the King Naked, Cleveland Fuzzy Tip, Mexican 128–6, Nankeen Lint, Sea Island, and Sakel × Pima varieties of cotton were studied. These cottons possess different patterns of fuzz on the mature seed, although all varieties have a more or less normal distribution of lint. In King Naked cotton the seeds are devoid of fuzz; in Cleveland Fuzzy Tip the fuzz is restricted to a tuft of hairs at the micropylar end of the seed; while in the Mexican variety the mature seeds are covered with fuzz. The hairs in all varieties were found to have an essentially similar developmental history. The lint hairs, it is suggested, originate when or soon after the flower opens, while the first fuzz hairs appear only after the lint population has been fully determined. The period of fuzz initiation takes place from 5 to 10 days after the flower opens.

Fertilizers for potatoes.—Third report, B. A. BROWN ([*Connecticut*] *Storrs Sta. Bul. 223 (1938), pp. 16*).—Additional data are reported on several phases (E. S. R., 74, p. 190).

Green Mountain potatoes under continuous culture, 1929–37, on Charlton loam soil yielded highest when the fertilizer contained 100 lb. of nitrogen per acre, phosphoric acid 160, and potash 120 lb. Potatoes alternating with clover and timothy, usually cut for hay in a 2-yr. rotation, did not make significantly higher yields from more than 50 lb. of nitrogen or 120 lb. of phosphoric acid. Fully as much potash was required for maximum yields under rotation as under continuous culture. The average yields resulting from four optimum amounts of fertilizers in 4 of 8 yrs. were 10 or more percent higher for the rotation than for the continuous series. Those 4 yr. had insufficient precipitation during 1 mo. or more of the growing season and were seasons of generally low production. The importance of rotation for assuring better yields in adverse years is indicated.

Potatoes responded significantly to both lime and magnesium on depleted Merrimac sandy loam in each of 1935, 1936, and 1937. This was the only one of 18 experiments conducted since 1932 to measure the needs for lime and magnesium in potato fertilizers in which those materials caused definite improvements. The response to lime was greater than to magnesium. To insure against possible deficiencies in Connecticut soils, it is advised that potato fertilizers should include both lime and magnesium or that the land be treated with dolomitic limestone. A correlation was found between soil tests for lime and response of potatoes to lime but not for magnesium.

Sodium nitrate applied at seeding time in September stimulated twice as much growth of rye as applications in March or April. Regardless of time of application or amount of sodium nitrate added to rye plowed under for potatoes, reducing the direct application of nitrogen from 100 to 50 lb. per acre resulted in marked decreases in the potato yields in both 1936 and 1937.

Four phosphates prepared by the T. V. A. for experimental purposes produced, in 1936 and 1937, slightly smaller yields of potatoes than commercial 40-percent superphosphate.

Effect of storage and repeated sprouting of seed potatoes on their growth and productiveness, P. M. Lombard (*U. S. Dept. Agr. Circ. 465 (1938), pp. 8, figs. 7*).—Potatoes held in a potato house for 66 days with a relatively high humidity and a storage temperature not over 34° F. during winter and from 36° to 50° through April and May sprouted very little, and the average loss in weight for three seasons was 6.8 percent for Irish Cobblers (A) and 7.2 percent for Green Mountains (D). When a second lot of each was held in the greenhouse for the same period in the dark with a high temperature and a low humidity, and two sets of 2-in. sprouts were removed in 1927 and three sets in 1928 and 1930, the loss in weight, including removed sprouts, averaged 19.1 percent for Irish Cobbler (B) and 19.5 for Green Mountain (E). Lots held in the greenhouse for the same period in subdued light with the same temperature and humidity as the preceding and the tubers allowed to green and sprouts to develop lost weight averaging 15 percent in Irish Cobbler (C) and for Green Mountain (F) 18.3 percent. Field observations indicated delayed emergence and blooming of plants produced by lots B and E. A large percentage of the tubers had lost apical dominance and only lateral sprouts were developing. In lots A and D and C and F, strong sprouts were already present when the tubers were planted, and in C and F the sprouts were of considerable length. Sprout removal to the extent of three sets of 2-in. sprouts evidently did not significantly reduce the yield of these two varieties.

Grain and forage sorghums in Nebraska, T. A. Kiesselbach, R. L. Cushing, and E. F. Frolik (*Nebraska Sta. Bul. 316 (1938), pp. 28, figs. 13*).—Information on growing sorghum for grain and forage, based on experiments and experience in Nebraska and elsewhere, considers the characteristics and classification of varieties grown in the State; the choice of varieties; seed selection and treatment; cultural, harvesting, threshing, and storage practices; utilization; rotations; and the avoidance of poisoning from sorghum. Varieties included in the recommendations for four definite areas in Nebraska are Early Kalo, Kalo, Sooner, Cheyenne, Greeley, Improved Coes, Day, Pink kafir, and Western Blackhull for grain; and Atlas, Leoti, Black, Amber, Early Sumac, and Kansas Orange for forage. See also a previous note (E. S. R., 75, p. 332).

A comparative study of an early, a medium, and a late strain of timothy harvested at various stages of development, M. W. Evans and L. E. Thatcher. (*U. S. D. A. and Ohio Expt. Sta.*). (*Jour. Agr. Res. [U. S.], 56 (1938), No. 5, pp. 347–364, figs. 11*).—Early and late timothy selections (E. S. R., 76, p. 623) and ordinary timothy, which blooms and matures at a medium date, were planted in mixture with common red clover. Two crops of mixed timothy and clover were harvested in 1932, one crop of timothy with a light mixture of clover in 1933, and a crop of clear timothy in 1934. Quadruplicate plats usually were harvested of each crop at six stages of development. A gradual increase in yields of hay was evident up to about the time when the timothy began to mature. The percentages of protein decreased as the season advanced. The largest yields of protein per acre were obtained when the timothy was harvested from about the time it was fully headed until early bloom. Larger

total hay yields were produced by the early selection than by the other two strains. A somewhat larger proportion of clover appeared in the mixture with the late timothy, which, both alone and in mixture with clover, contained a higher percentage of protein than hay from the other two varieties.

Increasing the protein content of timothy, without sacrificing yield, by delayed applications of nitrogenous fertilizers, H. B. Sprague and A. Hawkins (*New Jersey Stas. Bul. 644 (1938), pp. 22*).—Nitrogen fertilization in early spring (1935–37) increased the growth of timothy but did not appreciably change the protein content at the normal time of hay harvest. Early harvesting improved the protein content but greatly reduced the yields of hay per acre. The nitrogen absorbed by timothy at the heading stage appeared to be converted rapidly into organic compounds, principally proteins, within 10 days.

Soluble nitrogenous fertilizers applied (1935–37) to timothy in mid-June at rates equivalent to 125 lbs. of sodium nitrate increased the crude protein content of hay from 6.45 to 7.74 percent in 10 days after treatment and from 5.85 to 6.74 percent in 20 days; and the aftermath was increased approximately 40 percent. Calcium nitrate surpassed ammonium sulfate, sodium nitrate, and ammonium phosphate, which were about equal in value when applied in mid-June to timothy on loam of medium fertility and mild acidity. Spring treatments with superphosphate slightly increased hay yields but did not affect the efficiency of utilization of nitrogen by grass. Manure applied in mid-April stimulated hay yields to some extent but did not improve protein content. Increasing the amount of nitrogen fertilizers in mid-June to an equivalent of 250 lb. of sodium nitrate increased the protein content of the hay, but such rates seemed uneconomical.

Greater recovery of nitrogen fertilizers and increases in protein content of hay were obtained in moist than in dry seasons. In dry years nitrogen recovery as plant protein was considerably higher at the 20-day harvest than at the 10-day, although in moist seasons 10 days were ample for conversion of nitrogen to protein.

Recommendations are that sodium nitrate be used at rates not in excess of 125 lb. per acre on timothy grown on soils of moderate to strong acidity and either sodium nitrate or ammonium sulfate on mildly acid to neutral soils. About 10 days should elapse between treatment and harvest in moist seasons and 20 days in dry seasons to allow enough time for absorption of the fertilizer and its conversion into protein.

Some correlations in plant-tissue composition, decomposition products, and effect upon crop rotation with tobacco, W. S. Eisenmenger. (Mass. Expt. Sta.). (*Jour. Agr. Res. [U. S.], 56 (1938), No. 4, pp. 309–316*).—In further studies (E. S. R., 59, p. 243; 72, p. 150), attempts were made to correlate results relative to tobacco rotations obtained in the greenhouse, laboratory, and field. Nitrogen fractions resulting from decomposition of different types of plant tissue in soil—corn, timothy, redtop, ragweed, horseweed, and tobacco—were estimated; and the amounts of lignin, pentosans, carbon, and nitrogen and their ratio, rates of ammonification and nitration, and growth-promoting values were calculated when equal amounts of nitrogen from each of the different plants were added to soil.

Timothy and corn showed high percentages of total nitrogen, total soluble nitrogen, and of ammonia, the highest percentage of protein, a low percentage of amides, and the lowest percentage of nitrate nitrogen. Ragweed, horseweed, and tobacco showed lower percentages of each of these fractions except nitrates, which were higher. Redtop resembled the other grasses in decomposition of organic nitrogen except it was relatively high in nitrates and low in protein.

A distinct group of plants which comprised the grasses corn, timothy, and redtop contained higher percentages of carbon, low percentages of nitrogen, a high carbon : nitrogen ratio, high pentosans, high lignic acid, low ammonification and nitrification, and low-growth-promoting values. The other group—ragweed and tobacco—showed lower carbon values, higher nitrogen values, and lower carbon: nitrogen ratio, lower pentosans, lower lignic acid, higher ammonification and nitrification, and higher growth-promoting values. In practice, timothy and corn were found to be unsatisfactory for tobacco rotation, while ragweed, horseweed, and tobacco were desirable. Redtop was less desirable than tobacco and ragweed, but more desirable than timothy or corn.

"It would seem that plants containing the higher values of lignin, pentosans, high carbon : nitrogen ratios, and a subsequent low tendency to protein decomposition in soil may be suspected of being undesirable for tobacco rotation."

Tobacco Substation at Windsor, report for 1937, P. J. Anderson, T. R. Swanback, and O. E. Street (*Connecticut [New Haven] Sta. Bul. 410 (1938), pp. 329–449, figs. 39*).—Further progress of fertilizer and cultural experiments with cigar leaf tobacco (E. S. R., 77, p. 330) is reviewed. Articles on control of diseases and insects are noted on pages 352 and 361 of this issue.

Quantity of fertilizer nitrogen required for an acre of tobacco (pp. 335–353).—Havana Seed tobacco grown on Merrimac sandy loam with a coarse sandy subsoil, 1932–37, received increasing rates of nitrogen in the complete fertilizer, of from 100 to 300 lb. per acre in one series and from 80 to 240 lb. in a second series. When all factors of quality and yield are considered, 200 lb. of nitrogen per acre gave best results. Yet, there were indications that the optimum might be between 200 and 250 lb.

For maximum yield of leaf the nitrogen rate evidently should rise to 300 lb., although this rate increases the percentage of darks and tends to make the leaves heavier and coarser. Increased nitrogen application has increased both length and width of leaves in the middle portion of the plant but did not change leaf shape or increase the size of midvein in proportion to the size of the blade. Too little nitrogen has made the cured leaves dead, yellow, inelastic, and dry, and reduced the value and yield of the crop. High rates of nitrogen amplification did not impair fire-holding capacity, which was reduced by low nitrogen (100 lb.) Weekly determinations of soil nitrate disclosed distinct levels for each increment of nitrogen. With applications of less than 200 lb. per acre, soil nitrates dropped too low during the last 3 weeks the crop was in the field. Rates above 200 lb. tended to oversupply the plants in the critical ripening period. Each increase in fertilizer nitrogen was reflected in further increase in total nitrogen in the leaf. Magnesia in the leaf increased in proportion to the nitrogen, and calcium had a somewhat similar relation but not so close as magnesium.

Differences with other findings are explained by the dissimilar rates of application in experiments of Jenkins (E. S. R., 9, p. 543) and by the heavier and more retentive soil types used by Beaumont and Snell (E. S. R., 78, p. 622).

Further trials with soybean oil meal (pp. 353–360).—Soybean oil meal so far has produced somewhat higher yield and better quality of Havana Seed tobacco than has cottonseed meal, and the results were correlated with a higher rate of nitrification for soybean oil meal. No advantage in using meals with too high a percentage of water-soluble nitrogen was noted. With shade-grown tobacco, indications were that soybean oil meal will produce superior tobacco as compared with cottonseed meal. Yield was not improved, but the leaves were thinner and more elastic, the colors more uniform, and the percentage of high value grades correspondingly increased.

Nitrate nitrogen and soil acidity production by nitrogenous fertilizers.—II, Effect of liming, O. E. Street (pp. 360–368).—The study of nitrate nitrogen and soil acidity production by single sources of nitrogen, reported earlier (E. S. R., 76, p. 185), was continued. The only change in treatment was the application in varying amounts of calcic hydrated lime in May 1936. Nitrate production (1936–37) after liming did not vary greatly from that (1932–35) previous to liming, the least effect being noted for organic fertilizers. Stimulation up to mid-July and repression for the balance of the season was noted for urea and ammonium sulfate. Limed ammonium-sulfate plats produced lower nitrate levels than unlimed plats during the first 2 of a 5-yr. experiment. During the last 2 yr. liming greatly stimulated nitrate production. The extreme concentration of acids in the unlimed soil was detrimental to biologic activity. Decrease in soil acidity was as much as 1.95 pH units with ammonium sulfate. The acidic character of all the organics were similar. Urea was more strongly acidic, cal-nitro less so, and cyanamide and sodium nitrate were basic in their effects on soil reaction.

Time of harvesting Havana Seed tobacco, III (pp. 368–374).—Results of the 1937 tests were very similar to those of 1935 and 1936. To date a large and continuous increase in weight of the crop has occurred after topping up to 3 but not to 4 weeks, with corresponding improvement in grading during the 3 weeks, and in 1937 to the fourth week. The increase in yield seemed due to increase in leaf size and thickness subsequent to topping. The color (too green at first week) improved each week. The longer the leaf was left in the field after topping, the more quickly it cured and the less it was affected by pole rot and bundle rot. Analyses of cured samples from each week of harvest showed that the nitrogen and potash percentages decrease regularly each week, calcium increases, and the magnesia percentage remains about the same without significant fluctuations. Strain differences were evident.

Time of picking Shade tobacco (pp. 374–381).—In both 1936 and 1937, pickings of shade-grown tobacco begun 3 days after the second budding of plants and from 5 to 8 days after the first budding (medium picking) were about equal, in value of the first three primings, to pickings begun on the date of second budding (early picking). In 1936 medium picking was more valuable for top primings, while in 1937 early picking was worth much more. Late priming usually was the poorest, causing a loss of $227 per acre compared with medium in 1936, and $377 compared with medium and $586 compared with early in 1937. In a season of normal to dry weather conditions an interval of 4 days between first and 1½ pickings, with 10-day intervals between succeeding pickings, depending on rains, was suitable. Hastening late pickings to avoid harvesting starved tobacco seemed to be the best practice in a season of heavy and depleting rains.

The rôle of cover crops in the maintenance of the fertility of tobacco soils, M. F. Morgan and O. E. Street (pp. 382–393).—As in previous plat experiments with cover crops (E. S. R., 67, p. 383), lysimeter experiments herein reported showed increased tobacco yields. Yearly conservation against losses by leaching were about as follows for oats or rye cover crop during the 6 yr. ended May 25, 1937: Nitrogen 45 to 50 lb. per acre, potash 15 to 20, magnesia 2 to 5, and lime 25 to 50 lb. per acre. Under heavy tobacco fertilization, tobacco utilizes only a small portion of the nitrogen and lime thus held back in the soil, but much of the potash is withdrawn by the crop and increased tobacco growth with cover crop may remove from the soil more than the amount held against leaching. Lysimeter experiments under tobacco fertilization commonly practiced in the section indicated that when cover crops such as oats or rye

are grown between successive tobacco crops, fertilizer constituents applied are in excess of removal by both crop and leaching to the extent of nitrogen from 80 to 90 lb., phosphoric acid from 30 to 40, potash from 5 to 10 lb., and magnesia 0. There is a yearly depletion of from 60 to 70 lbs. of lime when no special lime carrier is used in the fertilizer. Both oats and rye surpassed timothy in fertility maintenance under cover cropping conditions. Definite evidence was shown of the role of crop residues, organic fertilizers, and cover crops in maintaining the humus content of the soil.

Malnutrition symptoms due to deficiencies or excesses of plant food elements (pp. 393–406).—Results of observations and experiments made over a number of years on effects of deficiencies and excess supplies of various nutrient elements are summarized briefly for aluminum, boron, calcium, chlorine, copper, iron, magnesium, manganese, nitrogen, phosphorus, potassium, sodium, sulfur, and thallium.

The role of yeasts in the fermentation of tobacco.—I. Preliminary studies. O. E. Street (pp. 414–443).—The technic and practice followed in fermentation of Connecticut cigar leaf types are discussed, the present knowledge of fermentation of tobacco is summarized, and results of a study of the application of suspensions of bakers' yeast to Havana Seed and Connecticut Shade are presented.

With Havana Seed tobacco fermented in small cases in constant temperature and humidity, temperature gains were greater with all yeast treatments than with water. Aeration greatly prolonged the period of high temperature gains. Carbon dioxide production was at a very high rate in all treatments, reaching 1,200 mg per hour, enough being produced to account for most of the dry weight loss. No loss of ammonium was detected at any time. A slight decrease in acidity of the tobacco occurred during fermentation. All yeast treatments produced tobacco which seemed more completely fermented, as judged by appearance and smoking qualities. Moisture contents above 30 percent water were detrimental.

With shade-grown tobacco fermented in bulks, temperature gains did not consistently favor either the yeast-treated or the check leaf; small differences in moisture content were more significant in determining rate and extent of temperature rise. Lighter and more uniform colors and thinner and more pliable leaves were found with yeast treatments. When shade-grown tobacco was fermented in small cases, temperature gains were enhanced by yeast treatments. Results similar to those observed with Havana Seed were obtained in degree of fermentation, lightness, and uniformity of colors. Tobacco transferred from small cases to a bulk failed to show benefits from yeast applications.

Relation of certain plant characters to strength of straw and lodging in winter wheat, I. M. Atkins. (U. S. D. A. and Tex. Expt. Sta.). (*Jour. Agr. Res.* [*U. S.*], *56* (*1938*), *No. 2, pp. 99–120, fig. 1*).—The relation of lodging to various plant characters, including breaking strength of straw and weight per unit length of culm was studied in from 18 to 129 winter wheat varieties grown, 1931–34, at Denton, Tex. Lodging data for a number of the same varieties grown by experiment stations of 11 other States were correlated with the breaking strength of straw and certain other characteristics of the same wheats grown at Denton.

The average lodging in winter wheat varieties was correlated significantly with breaking strength of straw and with weight per unit length of culm near the base of the plant. Breaking strength and culm density, which were fairly constant from season to season, are considered more accurate for evaluating

lodging resistance than a single season's observation of lodging. Weight per unit length of culm is preferred to breaking strength of straw as an index of lodging resistance because of greater ease in determination and equal or superior accuracy. Plant height, internode length, grain yield, and date of maturity were not correlated uniformly with lodging resistance.

Quality studies in the wheat-breeding program at the Minnesota Agricultural Experiment Station, E. R. Ausemus, M. C. Markley, C. H. Bailey, and H. K. Hayes. (U. S. D. A. and Minn. Expt. Sta.). (*Jour. Agr. Res.* [*U. S.*], *56* (*1938*), *No. 6, pp. 453–464*)—Milling and baking tests were made on varieties and hybrid strains of wheat grown as a part of the spring and winter wheat breeding program, 1927–33, in rod-row and 1/40-acre plat trials of the station. Correlation analysis was used to determine interannual, interstation, and intercharacter relationships for test weight, wheat protein, milling yield of straight grade flour, water absorption of the dough, loaf volume and color, and texture and grain of the cut crumb of the loaf.

The magnitude of the interannual correlations tended to be low with the exception of crumb color, which seemed less affected by environment than were the other characters. Interstation correlations tended to be significant but of a low order. Intercharacter correlations indicated a close relationship between loaf volume and color, texture, and grain. The relation between test weight, protein content, and milling yield was not apparent when varieties of diverse origin were compared. Milling yield was independent of all factors affecting baking results.

Commercial agricultural seeds, 1937, G. P. Steinbauer (*Maine Sta. Off. Insp. 166* (*1937*), *pp. 110–126*).—The germination, purity, weed seed content, and for legumes the hard seed percentage are tabulated for 104 samples of agricultural seed collected from dealers in Maine in 1937.

Seed inspection, F. A. McLaughlin (*Massachusetts Sta. Control Ser. Bul. 92* (*1938*), *pp. 80*).—The purity, germination, and weed seed contents are tabulated for 218 official samples of field crops seed and mixtures and the germination for 511 samples of vegetable seed collected in Massachusetts during the period October 1, 1936, to December 1, 1937. Results of field tests for trueness to type and variety on 168 lots of vegetable seeds are included, with remarks on the quality of onion seed produced in the Connecticut Valley in the 1936 season. Studies of flower seeds made in cooperation with J. L. Anderson and C. L. Thayer, including tests of 103 samples of seed for purity, germination, and performance, are appended.

Summary of results of seed and legume inoculant inspection for 1937, J. G. Fiske (*New Jersey Stas. Bul. 638* (*1937*), *pp. 22*).—Dealers in New Jersey from whom the 2,560 official samples of crop and vegetable seed and seed mixtures were collected in 1937 are listed with compliances and violations indicated; and the crops, inoculation, and number of organisms are shown for 28 official samples of legume inoculants.

Bindweed eradication, F. D. Keim, D. L. Gross, and R. C. Kinch (*Nebraska Sta. Circ. 50, rev.* (*1938*), *pp. 12, figs. 6*).—A revised and enlarged edition (E. S. R., 73, p. 176).

Chemical weed control, F. E. Hance (*Hawaii. Planters' Rec.* [*Hawaii. Sugar Planters' Sta.*], *42* (*1938*), *No. 1, pp. 3–37*).—Results obtained in weed control with chemicals throughout the world (covering 123 references) are reviewed under the general topics of sodium and other chlorates, oil sprays, less common weed eradicants, and arsenicals, and the merits of different chemicals are indicated with hazards and precautions to be observed.

HORTICULTURE

[**Horticultural studies by the Arkansas Station**] (*Arkansas Sta. Bul. 351 (1938), pp. 51–55, 57, 58–63, 63–67*).—Among studies discussed are the effects of ovarian and stylar extracts on pollen tube development in the apple, and effects of fertilizers on growth and fruiting of the peach, both by J. R. Cooper; fertilizer and cultural treatments for the strawberry, by Cooper and J. E. Vaile; fertilizers for vegetables, by Cooper and V. M. Watts; varietal studies with vegetables, selection of cucumbers for increased production of pistillate blooms, and spacing and time-of-planting tests with the tomato, all by Watts; the effect of soil reaction on strawberry and vegetable production, by Watts and Cooper; cover crops for the apple, pear, and peach, by Cooper; green manures for the cucumber, by Cooper and Watts; rootstocks for the cherry, time-of-planting trials with the cherry, pruning of apples and peaches, and tests of ornamentals, all by Cooper; and factors influencing the uneven ripening of grapes, effect of rootstock on the grape, breeding and variety testing of grapes, varieties of strawberries, germination of grape seeds, extent of winter injury to raspberries and blackberries, and variation in the sex of strawberries and cucumbers as influenced by environmental treatment, all by Vaile.

[**Horticultural studies of the New Haven Station**] (*Connecticut [New Haven] Sta. Bul. 409 (1938), pp. 278, 286, 287, 305, 306, 307, 312, 313*).—Among studies discussed are efficacy of spray residue removal, sand culture of plants, the breeding of hybrid sweet corns, summer squash, peppers, strawberries, and garden beets, and fertilization for peppers.

[**Horticultural investigations conducted by the Maryland Station**], A. L. Schrader (*Maryland Sta. Rpt. 1937, pp. XXXV–XXXVII*).—Herein is presented a brief review of 50 yr. of horticultural investigations at the station.

[**Horticultural investigations by the New Jersey Stations**] (*New Jersey Stas. Rpt. 1937, pp. 38, 39, 42, 58–78, 104*).—Among studies the progress of which is discussed are fertilizers for blueberries and cranberries; methods of harvesting cranberries; the usefulness of rapid soil tests for determining the fertility of blueberry soils; the blooming dates of peach varieties in 1937; peach breeding studies; statistics on peach, almond, and nectarine trees at the station; use of red and copper-leaved peaches as understocks; effects of mineral deficiencies on the peach and apple; factors responsible for the poor growth of young peach trees set on old peach sites; apple breeding; morphological, chemical, and physical conditions in sassafras soils affecting the root development of the apple; thinning of apple fruits; strawberry breeding; resistance of strawberries to black root; raspberry soil management; varieties of small fruits; tomato breeding; varieties of tomatoes and peppers; relation of size of Ebenezer onion sets to yield and quality of marketable onions; relation of environment to composition of onion sets; factors affecting the quality of bunch carrots; effect of lime, fertilizer, and organic matter on the tomato; value of fertilizing old sod in preparation for the culture of vegetables; effect of the relation of potash to lime on the yield of beans; relation of the amount of potash to the growth of tomatoes; comparative response of different lima bean varieties to different soil nutrient levels; causes of over-liming injury to the tomato and other vegetables; effects of varying the calcium: sodium ratio on the growth of the tomato; effect of soil temperature on tomato varieties; nutritional requirements of the gardenia; selection of gardenias for flower production; culture of carnations, sweet peas, and poinsettias; influence of preharvest wash sprays on spray residue removal; stickers for lead arsenate on apples; spray residue removal from cherries; influence of insect and honeydew residues on spray residues; and causes of the abnormalities in the germination of lima beans.

[**Horticultural investigations by the South Carolina Station**] (*South Carolina Sta. Rpt. 1937, pp. 40–42, 120–127, 147, 148, 151, 152*).—Investigations covered in this report included apple pollination and sterility studies, by A. M. Musser and F. S. Andrews; studies of the structure and function of the leaves of the Henderson and Fordhook varieties of bush lima beans as related to fruitfulness under hot, dry conditions, by Andrews; asparagus fertilizer tests, by L. E. Scott; fertilizer requirements of beans and cabbage, and cucumber variety test, both by J. M. Jenkins, Jr.; and breeding of cabbage possessing resistance to cold and early seeding, and selection of improved types of collards, both by W. C. Barnes, Jenkins, and J. J. Mikell.

[**Horticultural studies by the Washington Station**]. (Partly coop. U. S. D. A.). (*Washington Sta. Bul. 354 (1937), pp. 24, 44, 45, 46–49, 50, 67, 68, 73, 74*).—Among studies the progress of which is discussed are characteristics of maturing apples, by J. L. St. John and F. Van Amburgh; orchard cover crops as affected by fertilizers and sprays, by O. M. Morris and F. L. Overley; measurable characteristics of maturing and ripening apples and peaches, by E. L. Overholser, Overley, and Morris; removal of arsenic, lead, and other residues from fruits, by Overholser and Overley; propagating hardy apple stocks by hardwood cuttings, by Morris; winter injury to fruit trees, by Overholser, Overley, and L. B. Wooton; pollination factors affecting the set of fruit in Washington orchards, by Overholser, Overley, and W. J. Clore; spray injury to fruit trees, by Overholser, Overley, and J. B. Rogers; fertilization of orchards, by Overholser, Overley, Clore, and Wooton; breeding raspberries for hardiness and disease resistance, by Schwartze, G. A. Huber, and Clore; orchard irrigation, by Overholser, Clore, and Wooton; and selection and breeding of tomatoes, by Burk, Morris, Schwartze, and Clore.

Studies reported from the Irrigation Substation at Prosser include soil moisture relationships in orchards, by C. A. Larson; and tree and fruit responses from irrigation, by Clore and Wooton.

Studies at the Cranberry-Blueberry Substation at Long Beach include storage tests of cranberries from plats sprayed with copper materials, weed control in cranberry bogs by spraying, and treatment of blueberry cuttings with root-promoting substances, all by D. J. Crowley.

Transplant responses, V. E. IVERSON. (Mont. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 562–565*).—Using a soil mixture consisting of one part manure, one part sand, and two parts loam with a pH of 7.65, various nutrient materials were compared for use at the time of pricking-off from the seedling flats. Nitrogen applications in general resulted in large, succulent top growth and inefficient root systems. In combination with potassium permanganate, nitrogen gave favorable results with tomatoes. Phosphorus gave good results with all types of vegetables, and a combination of phosphorus and dextrose gave very good results with head lettuce. Both potassium permanganate and dextrose when used alone stimulated root development. Temperature had a pronounced effect on the development of transplants, with the various species having different optima according to their nature.

The potassium content of soil beneath a straw mulch, I. W. WANDER and J. H. GOURLEY. (Ohio Expt. Sta.). (*Science, 86 (1937), No. 2241, pp. 546, 547*).—In an orchard where potassium as a whole was found very low and where applied potassium failed to move downward into the root zone, there was found very large contents of potassium to a depth of from 24 to 32 in. or more beneath a 38-year-old mulch. In no case had potassium fertilizers been applied to the mulched trees. The same condition was found in a nearby orchard where mulch had been applied to part of the area for 22 yr. The soil beneath two mulched

trees had a content of 1,000 lb. per acre of available potassium to a depth of 2 ft., while 40 ft. distant under clean cultivation there was less than 175 lb. of potassium to a 2-ft. depth.

Imperial 44—A new Iceberg-type lettuce for New York State, J. E. Knott. ([N. Y.] Cornell Expt. Sta.). (*N. Y. State Veg. Growers' Assoc. Bul., 17 (1938), No. 1, p. 3*).—Among a number of unnamed seedlings secured from the U. S. Department of Agriculture, a strain designated as Imperial 44 was found promising despite the fact that in California it had shown no commercial value. From 41 to 73 percent of good heads were marketed from six plantings maturing between August 7 and 28, a period when other varieties failed to head.

Fertilizer placement for canning peas in Wisconsin, F. L. Musbach. (Wis. Expt. Sta.). (*Canner, 86 (1938), No. 9, pp. 15, 16, 18, figs. 3*).—At the Marshfield Substation, the use of 250 lb. of a 2-12-6 fertilizer mixture drilled in the row with the peas gave 1,760 lb. of harvested peas per acre, as compared with 1,380 lb. for the unfertilized and 1,541 lb. where 500 lb. of the same fertilizer was broadcast. There was no detrimental effect of drilling fertilizer in the row on stand or on the growth of bacteria resulting from inoculation. The indications were that larger applications of a material containing a higher percentage of nitrogen would cause injury during drought periods. Usually, unfertilized plats showed lower stands than did the fertilized, due, apparently, to the fact that the fertilizer stimulated the development of the weaker plants. The studies of side-row placement suggested that such is desirable, particularly on light-textured soils, when using materials with a high nitrogen content.

A morphological study of flower and seed development in pepper, H. L. Cochran. (Ga. Expt. Sta.). (*Jour. Agr. Res. [U. S.], 56 (1938), No. 6, pp. 395–419, figs. 16*).—The results are presented of a cytological study of the World Beater variety of garden pepper, with special reference to macro- and microsporogenesis and the development of the macro- and microgametophytes. The higher the temperature up to 90°–100° F. the more rapidly did anthesis occur. The photoperiod also had a pronounced effect on anthesis. At 70°–80°, 42 hr. elapsed between pollination and the first evidence of fertilization, with the division of the zygote commencing from 24 to 36 hr. later.

Production of radishes, J. H. and W. R. Beattie (*U. S. Dept. Agr. Leaflet 157 (1938), pp. 4*).—This contains general cultural and handling information.

Tomato varieties, G. Morrison (*Michigan Sta. Spec. Bul. 290 (1938), pp. 68, figs. 16*).—Through cooperation with a commercial seed company, which since 1868 has tested many hundreds of varieties of tomatoes, there are presented herein descriptive and commentary data on a large number of tomato varieties, including the leading commercial sorts and many odd types. In the introductory paragraphs there are discussed the history of the tomato as a garden vegetable, modern breeding methods, and the need of standardization of varieties.

Responses by tomato plants to artificial illumination, J. W. Mitchell (*Bot. Gaz., 99 (1937), No. 2, pp. 412–419, figs. 2*).—Tomato plants, grown beneath a Mazda lamp and beneath a carbon arc light with radiant energy equalized by means of a thermopile placed at the leaf surface in one instance and with a Weston photronic cell in the other, were compared as to dry weight increment and carbohydrate content. Plants beneath the arc lamp grew less in height and synthesized more than twice as much solid matter and approximately four times as much acid hydrolyzable material in a given period as did the Mazda-lighted plants. The author suggests that there may have been radiated from the arc a greater intensity of wavelengths known to accelerate the process of photosynthesis. The use of the photronic cell as an equalizer of radiant energy tended to lessen the differences between the two lots of plants.

Soil moisture as an indication of root distribution in deciduous orchards, F. J. VEIHMEYER and A. H. HENDRICKSON (*Plant Physiol., 13 (1938), No. 1, pp. 169–177, figs. 3*).—Systematic samplings in a 13-year-old peach, prune, and walnut orchard growing on Yolo loam soil at Davis, Calif., showed such uniform distribution of soil moisture at comparable depths as to indicate that the trees had a uniform distribution of roots. The permanent wilting percentage was reached at a given depth of soil close to the tree as soon as it was midway between adjacent trees. It was evident that under the existing conditions reliance could be placed on a system of soil sampling during the growing season as a basis for an efficient irrigation schedule. The authors point out that relative wetness will not aid in interpreting results where root distribution is not uniform. In such cases it may be better to base irrigation practices upon observations on the trees or indicator plants grown in the orchard. Regular soil sampling gives the grower an earlier indication of moisture than does tree or plant observation.

The first season's growth of apple grafts as affected by type of stock and part of cion, C. S. WALTMAN (*Kentucky Sta. Circ. 49 (1938), pp. 11*).—Comparison of whole- and piece-root grafts and top and basal portions of scions showed no significant difference in either height or diameter growth of the resulting trees at the close of the first growing season. The number of small trees was nearly the same in the different groups, but percentage mortality was considerably greater with piece roots than with branched whole roots. Equally good results were obtained by using the tip or the basal half of the scion. In all lots there was noted a high degree of correlation between height and diameter in the young trees.

A study in recovery of transplanted apple trees, M. B. CUMMINGS and R. G. DUNNING (*Vermont Sta. Bul. 432 (1938), pp. 24, pls. 4*).—Observations on the behavior of young bearing apple trees following transplanting showed that growth was hindered, development retarded, and fruit production deferred. The inhibiting effect on growth was manifested in reduced twig elongation and number of leaves. Even in the third year after moving, the transplants were greatly behind the controls in production. The hardier varieties among the transplants, such as Cortland, Haralson, and Lawver, bore most of the fruits. The methods of transplanting are discussed.

Physiology of apples in artificial atmospheres, C. A. EAVES (*Sci. Agr., 18 (1938), No. 6, pp. 315–338, pls. 4, figs. 7*).—Low and high concentrations of carbon dioxide in the storage atmosphere stimulated and depressed, respectively, the total carbon dioxide output of apple fruits. Low concentrations of oxygen increased the carbon dioxide output, but when the fruits were returned to the air the rate of oxygen uptake was lower than in fruits stored continuously in air. Fruits held in 5 and 10 percent of carbon dioxide at 3.5° C. for several months and then removed to 21° respired more rapidly than controls stored in air. In apples stored in 2.5, 5, and 10 percent of carbon dioxide over long periods, there was found an increased H-ion concentration. With 100 percent of carbon dioxide, there was an decrease in H-ion concentration of apple and pear juices. With 100 percent nitrogen, there was a slight increase.

Respiration and oxidase and catalase activity of apple and pear fruits, B. D. EZELL and F. GERHARDT. (U. S. D. A.). (*Jour. Agr. Res. [U. S.], 56 (1938), No. 5, pp. 365–386, figs. 8*).—The oxidase and catalase activity of apple and pear fruits under various conditions was studied in relation to rate of respiration and to each other. When fruit was held in storage and the rate of respiration varied either by physical or chemical means, no comparable change in oxidase or catalase activity took place. Both respiration and enzyme activity

decreased in Bartlett pears during the growing season from the time the fruit was very small (average weight 19.1 g) until commercially mature. Oxidase continued to decrease as long as the fruit remained on the tree, while respiration and catalase increased in fruit allowed to remain on the tree past the normal harvest season. The interrelationship of oxidase, catalase, and respiration is discussed, and a possible explanation is suggested for the apparently conflicting results obtained by workers who have tried to correlate respiration with oxidase or catalase activity.

Oxidase and catalase activity of Bartlett pears in relation to maturity and storage, B. D. Ezell and F. Gerhardt. (U. S. D. A.). (*Jour. Agr. Res. [U. S.], 56 (1938), No. 5, pp. 337-346, figs. 4*).—The activity of oxidase and catalase in Bartlett pears was determined at various intervals during growth, and in storage at 32° F. Oxidase decreased throughout the growing period. Catalase formed a U-shaped curve. The minimum catalase activity occurred at or near the time at which the fruit should be harvested for best quality. Catalase activity was higher after storage at 32°. In the less mature fruit oxidase activity was also higher, so that there was a tendency for maturity differences to be exaggerated during storage at 32°.

Effect of carbon dioxide storage on Bartlett pears under simulated transit conditions, F. Gerhardt and B. D. Ezell. (U. S. D. A.). (*Jour. Agr. Res. [U. S.], 56 (1938), No. 2, pp. 121–136, fig. 1*).—Studies conducted at Wenatchee, Wash., upon the tolerance of Bartlett pears to carbon dioxide used in different concentrations and under different temperatures and durations of treatment indicated that whereas air storage at from 30° to 31° F. is most desirable, under conditions where these temperatures are not practicable artificial atmospheres of carbon dioxide are effective in prolonging the life of the pear. The storage life of pears held at 45° for 20 days in 20 percent of carbon dioxide and for 30 days in 35 percent of carbon dioxide was not significantly different from that of comparable pears stored at 32° immediately after harvest. There was no evident loss of quality upon ripening at 65°. Carbon dioxide apparently retarded ripening by curtailing the processes associated with the hydrolysis of protopectin, leading to the suggestion that a determination of the soluble pectin in the pear may prove of value as an index of the degree of maturity and the potential keeping quality of the fruit. Carbon dioxide had a marked tendency to prevent the appearance of surface scald.

The Washington and Tahoma red raspberries, C. D. Schwartze (*Washington Sta. Pop. Bul. 153 (1938), pp. 11, figs. 2*).—Herein are announced with brief introductory comments and descriptive data two new red raspberries developed by the station for adaptability to the region west of the Cascade Mountains, where Cuthbert and some other presumably hardy varieties suffer winter injury due to the lack of an adequate rest period. The Washington raspberry was obtained from a cross of Cuthbert and Lloyd George, and the Tahoma from a cross of Lloyd George and Latham.

Influence of environment on citrus, H. J. Webber (*Calif. Citrogr., 23 (1938), No. 3, pp. 108, 126, 130*).—In this paper the author discusses temperature requirements for growth, bloom, and proper maturation of the fruit; the effects of atmospheric humidity on shape, character, and quantity of fruit; hours of essential sunlight; and effect of length of day. Among points brought out are that 55° F. is about the minimum temperature at which growth can occur, that the optimum temperature range is approximately from 73.5° to 91.5° for the sweet orange, that temperatures in February and March largely control the time of bloom in the Washington Navel orange in California, and that day length plays only a very minor role in influencing the date of bloom and of maturity in the citrus.

Cold resistance studies with Satsuma orange trees, W. D. KIMBROUGH (*Louisiana Sta. Bul. 295 (1938), pp. 10*).—Beginning in 1932 in a young orchard set in the spring of 1931, the following treatments were compared: (1) 2 lb. per tree of a 3–8–6 fertilizer increased at the rate of 1 lb. per year for 3 yr.; (2) same as No. 1, plus 1 lb. of sodium nitrate in July 1932 and increased by 0.5 lb. per tree for 2 yr.; (3) same as No. 1, except that roots were pruned by plowing close to the tree; (4) same as No. 1, plus 1 lb. of muriate of potash in late September increased by 0.5 lb. per tree for 2 yr.; (5) same as No. 1, plus 1 gal. of blackstrap molasses per tree per year; and (6) no treatment. The trees on plats receiving extra nitrogen were most susceptible to low-temperature injury, with the root-pruned trees ranking next. None of the treatments had any material influence on the concentration of the expressed sap of the shoots nor did any treatment have any marked effect upon dormancy. There was a considerable seasonal change in sap concentration. The results were complicated by killing frosts in two of the experimental years, leading to the general recommendation that Satsuma oranges should not be planted in areas of frequent killing frosts unless orchard heating is feasible.

Some relationships between the bloom period and spraying dates, C. W. ELLENWOOD (*Ohio Sta. Bimo. Bul. 191 (1938), pp. 63–66*).—Based on observations extending over a 10-yr. period on 12 varieties of apples representing early, mid-season, and late-blooming kinds, the average length of the period between the date of first bloom and the beginning of full bloom was 6 days. The average length of time from the application of the first prebloom or scab spray until the beginning of full bloom was 20 days, with the shortest period 11 and the longest 30 days. Among the 12 apples, Oldenburg was earliest to bloom, and Rome Beauty, Northern Spy, and Golden Delicious were late-blooming. Between the earliest and latest varieties there was an average difference of 8 days in the appearance of the first blooms during the 10 yr.

Methods of evaluating the macadamia nut for commercial use and the variation occurring among seedling plantings in Hawaii, J. C. RIPPERTON, R. H. MOLTZAU, and D. W. EDWARDS (*Hawaii Sta. Bul. 79 (1938), pp. 26, pls. 6, figs. 4*).—Stating that plantings consist almost entirely of seedling trees and that there are two distinct types, rough- and smooth-shell, the authors present the results of studies of nuts collected from the important orchards. There was found in both the smooth and rough types a very high negative correlation between the specific gravity of the kernel and the percentage of oil. Specific gravity was also an index to roasting quality, as follows: Grades 1, 2, and 3 having specific gravities of less than 1, between 1 and 1.025, and above 1.025, respectively. The ratio between the weight of the unshelled nuts and the weight of grade 1 kernels was used as an index of quality. Individual trees showed great variation in nut characters, indicating marked possibilities for selective improvement. Considerable difference was observed between the smooth- and rough-shell types of nuts with respect to the roasted product. The smooth type, upon roasting, developed a light-brown color, crisp, tender texture, and a mild nutty flavor; while the rough type was darker in color, harder in texture, and of a burned variable flavor. The indication is that most of the rough-shell trees will be replaced by the smooth.

Bibliography on tung tree and tung oil, compiled by K. Ho and H. LIU (*Hankow, China: Govt. Testing Bur., 1937, pp. VII+175*).—There is presented a comprehensive list of titles of papers dealing with production, preparation, chemical and physical properties, utilization, etc. A foreword by C. Y. Wang is also included.

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Further responses of miscellaneous plants to temperature, K. POST (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 627–629*).—Comparing two environments—from 50° to 60° F., and from 60° to 70°—it was found that calceolarias and cinerarias were delayed in flowering by the higher temperatures and in many cases would not flower at all. In the yellow calla very little top or root growth occurred below 60°. A temperature of from 60° to 70° favored *Primula malacoides*.

The determination of the normal date of bud formation of short day plants, K. POST (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 618–620*).—The time of flower bud formation in several short-day flowering species, such as *Chrysanthemum morifolium* (var.), *Callistephus chinensis, Eupatorium coelestinum*, etc. was determined by placing plants at regular intervals during the growing period under conditions of day lengths shorter than normal. The dates at which the buds appeared, the color showed, and the blooms occurred were recorded, and the normal time when conditions were proper for bud formation was calculated therefrom.

Temperature, photoperiod, flowering, and morphology in cosmos and China aster, J. BIEBEL. (Ind. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 635–643*).—A brief report is presented on the results of a study on the effects of both temperature and photoperiod on the top and root growth and the flowering of the China aster and cosmos plants. The photoperiod had no appreciable effect on the top: root ratio of the cosmos. Higher temperature, averaging 68° F., stimulated growth, particularly of the top in cosmos. The lower temperature, averaging 55°, was too low for the best development of cosmos. With a given temperature the long photoperiod (from 16 to 18 hr.) increased top growth of the aster. Cosmos with from 16 to 18 hr. of light failed to bloom at any temperature utilized. Low temperatures with long days throughout life resulted in abundant flowering in the aster. High temperature and long days resulted in earlier flowering in the aster, but the flowers were not characteristically quilled. High temperature and short days did not prevent flowering in the aster, but the flowers were small and the stems short. With low temperature and short days the aster failed to bloom at all.

Prolonging the flowering period of chrysanthemums with the use of supplementary illumination, G. H. POESCH. (Ohio State Univ.). (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 624–626*).—Selecting varieties that bloom ordinarily during the latter part of November, it was found possible to delay, by supplemental light, the onset of flowering as much as from 4 to 5 weeks under certain conditions. Comparing Mazda lamps, those emitting a large percentage of blue rays, mercury-vapor lamps, and daylight lamps, Mazda was found by far the most effective in producing retardation. Flower production of pompoms was generally reduced by the retarding treatments. Standard and disbud varieties lend themselves most effectively to the treatment.

A preliminary study of the effect of an alfalfa meal mulch on carbon dioxide liberated and the growth of pompom chrysanthemums, R. S. BELL (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 646–648, fig. 1*).—Alfalfa meal applied as a mulch to several varieties of pompom chrysanthemums growing in the greenhouses of Cornell University had an inhibitory effect on growth. Since nitrates as determined by the phenol disulfonic acid test showed an increment, a lack of nitrogen in itself could not explain the lesser growth. The pH of the soil was not changed, and measurements of the carbon dioxide output from a measured unit of soil indicated a very rapid rate of decomposition of the alfalfa meal.

Easter lily breeding: Compatibilities in Lilium longiflorum stocks, P. Brierley, S. L. Emsweller, and J. C. Miller (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 603–606*).—Stating that seedling lilies, as far as known, are free from seed-borne virus troubles, the authors discuss the results of pollination studies with eight stocks of Easter lilies. All produced functional pollen and ovules. Only two of the eight produced seed from controlled self-pollination, but seven produced seeds when selfed but not bagged in an unscreened greenhouse. Cross-pollination was generally successful except in the case of Tall Creole-Short Creole-Floridii combinations. Croft × Creole produced capsules but no viable seeds. Short Creole and Floridii stocks behaved alike in all compatible relations. In field trials in Louisiana no seed was produced from controlled selfing of Creole plants or from interpollination among 43 Creole plants.

Pyrethrin I content of strains of Pyrethrum cinerariaefolium, R. E. Culbertson. (Penn. State Col.). (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 590–591*).—Studies of the pyrethrin I content of the flowers of several different strains of pyrethrum showed a range from 0.58 to 1.02 percent, which on a basis of from 0.3 to 0.5 percent for material from Japan and Dalmatia would indicate that flowers of superior quality may be grown in the United States.

Effect of alternating temperature on the flowering of lavender column stocks, K. Post and R. S. Bell (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 630–634*).—At least 18 hr. per day of a temperature below 65° F. was necessary to induce flower bud formation. A ratio of 1 day at 50° to 1 at 65° was the least at which flower buds would form. At 50°, 52 days from date of sowing were required to bring seedlings to bud initiation. When plants grown at 65° were placed at 50°, an average of 37 days was required to bring buds into visibility. Supplemental light, in the case of plants subjected to alternate temperatures, had no effect on bud initiation. Light influenced the form of leaf in that at 65° stocks produced linear instead of lobed leaves when they received more than 15 hr. of light per day.

Studies of the keeping qualities of cut flowers, A. Laurie (Ohio State Univ.). (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 595–597*).—The use of copper containers, copper wire, copper shavings, copper shot, and brass shot was found helpful in prolonging the life of cut flowers of certain species, of no benefit in several others, and harmful in the case of the carnation. The beneficial effect of cutting off stems under water was also found to vary with species. All cut flowers kept as well in shallow water as in deep, and in several cases shallow water increased life by from 2 to 3 days. In most species the greater portion of the water was absorbed through the cut end of the stem. There was an apparent negative correlation between the length of life of cut flowers and rate of respiration. Of many materials tested, only three, hydrozene sulfate, fluroglucinal, and resinol, had any effect in reducing the respiration rate.

Propagation of rhododendron Cunningham's White, by cuttings, L. C. Chadwick and W. E. Gunesch (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 607–611*).—Finding that the usual commercial methods of rooting cuttings resulted in a low percentage of success, the authors treated cuttings taken in early October in various ways and placed them in a grafting case maintained at from 60° to 65° F. A mixture of sand and peat proved better than peat alone. Favorable results were secured from the treatment of cuttings with potassium permanganate prior to planting. Sucrose and combined sucrose and potassium permanganate had an apparent favorable reaction on semimature cuttings.

Chemical treatments of the rooting media had no advantage and may actually be harmful.

Effect of growth substances on the rooting of woody ornamental plants, G. H. POESCH (*Ohio Sta. Bimo. Bul. 191 (1938), pp. 56–62*).—Using both crystalline acids and proprietary substances, tests were made on 110 or more species of woody ornamentals. Of the total, 57 species rooted and showed some response to treatment. As to concentration, the maturer and harder the wood, the stronger the concentration and the longer the length of treatment required. There was a saving in time of rooting of as much as from 2 to 3 weeks in certain species. In general, the greater response was secured from young cuttings, possibly because of the greater content of natural hormones in the younger tissues. There was observed no significant difference between the crystalline acids and the proprietary materials. It is pointed out that much more work is needed on the optimum concentrations, especially for naturally difficult rooting species. Among species which did not respond to treatment were *Abelia grandiflora*, *Cotoneaster* spp., *Daphne cneorum*, *Deutzia lemoinei*, *Juniperus virginiana*, *Prunus pissardi*, and *Ulmus pumila*.

Some less well-known rock plants in Ohio, F. H. BALLOU (*Ohio Sta. Bimo. Bul. 191 (1938), p. 67*).—A list is presented with height data of rock and alpine plants not commonly grown or known to the average Ohio nurseryman but considered of value for rock garden planting.

Planting and maintaining Colorado lawns, G. BEACH (*Colorado Sta. Bul. 442 (1938), pp. 16, figs. 7*).—General information is presented with reference to grading, preparation of the soil, selection of grass varieties, seeding, weed control, insect and disease control, fertilizers, renovation, etc.

Fungicides and insecticides, 1937, E. R. TOBEY (*Maine Sta. Off. Insp. 166 (1937), pp. 127–134*).—The results are presented of analyses of 69 samples of insecticidal and fungicidal materials collected by the State department of agriculture and examined by the station in 1937.

FORESTRY

Problems and program of the Northeastern Forest Experiment Station.—Annual report for 1937 (*U. S. Dept. Agr., Forest Serv., 1938, pp. [3]+61*).—This mimeographed account presents information on the program and work of the station during the 1937 season.

[Forestry investigations by the Arkansas Station] (*Arkansas Sta. Bul. 351 (1938), pp. 67–69*).—Among studies the progress of which is discussed are the relation of age of stand to number of trees in upland white oak and bottom-land cottonwood, development of cutting plans for white oak and cottonwoods, and site index for hardwoods, all by R. D. Stevens; and soil and topographic features influencing the distribution of forest types in Arkansas, forest-tree seed germination, and growth and survival in plantations, all by L. M. Turner.

[Forestry activities of the New Haven Station] (*Connecticut [New Haven] Sta. Bul. 409 (1938), pp. 303, 313, 314*).—Brief comments are presented on the distribution of forest nursery stock, forest soils, soil factors affecting tree survival, and response to fertilizers.

Growing nursery stock of southern pines, M. A. HUBERMAN (*U. S. Dept. Agr. Leaflet 155 (1938), pp. 8, figs. 4*).—A revision of Leaflet 35 (E. S. R., 61, p. 341).

Harvesting and selling seed of southern pines, P. C. WAKELEY (*U. S. Dept. Agr. Leaflet 156 (1938), pp. 8, figs. 3*).—This leaflet contains general information.

Growth prediction and site determination in uneven-aged timber stands, W. A. DUERR and S. R. GEVORKIANTZ. (U. S. D. A.). (*Jour. Agr. Res.* [*U. S.*], *56* (*1938*), *No. 2, pp. 81–98, figs. 9*).—Advantage is taken of the fact that a main even-aged group of trees may be distinguished within each uneven-aged timber stand. The basal areas and volume-basal-area ratios of stands of different densities are curved over the ages of their main groups, and these curves are used to predict growth in volume. Site is introduced as a function of age and average diameter. The relationships are expressed in the form of site and growth tables applicable to any stand of the cover type in question. A statistical analysis of the field data obtained in northern hardwoods shows that significant, even-aged groups of trees are actually present in so-called "uneven-aged" stands, and that only a small error is involved in determining the average age of these groups.

Factors influencing the discovery of forest fires by lookout observers, C. C. BUCK. (U. S. D. A.). (*Jour. Agr. Res.* [*U. S.*], *56* (*1938*), *No. 4, pp. 259–266, figs. 5*).—The partial influences of certain physical factors upon the time from the start of forest fires to their possible detection by lookout observers were determined through analysis of observations from lookout stations of 200 test fires in the ponderosa pine type of northern California. Atmospheric obscurity, background, distance, relative position of the sun, and behavior of the fire were recognized as the important governing factors. Quantitative measurements of the average influences of each of the last three factors and of their combined influence upon discovery time under favorable atmospheric visibility conditions are shown in graphic form. The need for further instrumental development in the measurement of atmospheric obscurity and of background characteristic is indicated.

Forest rights in foreign countries, with especial reference to grazing rights, W. N. SPARHAWK (*U. S. Dept. Agr. Circ. 456* (*1937*), *pp. 70*).—Stating that in the forests of many countries, particularly in Europe, there exists an exceedingly complicated situation with respect to rights, the author reviews the experience of a number of countries and sets forth certain general conclusions. Among complicating rights are those relating to wood, grazing, mast, litter, resin, bark, hunting, and the location of bees. An extended bibliography is included.

DISEASES OF PLANTS

The Plant Disease Reporter, May 15 and June 1, 1938 (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 22* (*1938*), *Nos. 9, pp. 145–166, figs. 10; 10, pp. 167–188, fig. 1*).—The following items are included:

No. 9.—Geranium crinkle in New Jersey, by P. P. Pirone; narcissus mosaic and early maturity, by F. P. McWhorter; further notes on the distribution of the witches'-broom of black locust (*Robinia pseudoacacia*); reports on apple scab for Massachusetts, Rhode Island, New York, and Idaho; reports on other fruit diseases, for New York and Idaho; rusts on small grains in the southern plains region; relative prevalence of *Diplodia zeae* and *D. macrospora* on corn, by H. W. Larsh; tobacco diseases in Kentucky; and brief notes on black stem of alfalfa in Kentucky, downy mildew on spinach in New York, frost damage to peach trees in Kentucky, and leaf blister on oak trees in the South.

No. 10.—Diseases of potato and tomato in Dade County, Fla., during the 1937–38 season, by G. D. Ruehle; early-season bean diseases at Charleston, S. C., by C. F. Andrus; diseases of early vegetables in Connecticut, by A. A. Dunlap; shorter notes on downy mildew (*Peronospora viciae*) on peas in South Carolina, pea mosaic on Long Island, tomato fruit mottle in Texas, and

virus diseases of lettuce in New York; notes on diseases of cereals and grasses in Oregon and adjacent counties in Washington during the spring of 1938, by R. Sprague; diseases of small grains in Georgia, by J. H. Miller; reports on rusts and other diseases of cereals in Texas, Oklahoma, Kansas, Nebraska, Arkansas, and California; tobacco downy mildew—appearance in New England and development in other States (Massachusetts, Connecticut, North Carolina, southern Maryland, middle Tennessee, and Kentucky); strawberry diseases in Delaware, by K. J. Kadow; notes on fruit diseases in Illinois, by H. W. Anderson; distribution of *Sphaceloma* and *Elsinoë* in California, by A. E. Jenkins; and brief notes on quince rust on apple in Tennessee, bacterial leaf spot of geranium in Oregon, and the Cobbler seed supply of the United States.

[Plant disease work by the Arkansas Station] (*Arkansas Sta. Bul. 351 (1938), pp. 70–80, fig. 1*).—Progress reports are included on a genetical, physiological, and pathological study of the cotton plant with special reference to wilt and the breeding of resistant varieties, and wilt resistance, both by V. H. Young, L. M. Humphrey, W. H. Tharp, and E. M. Cralley; a study of the etiology and control of seedling blights and boll rots of cotton in Arkansas, and a fruit spot of the Blakemore strawberry, both by Young; fire blight of apples and pears, by H. R. Rosen; biology and control of crown rust and winter injury of oats, by Rosen, L. M. Weetman, and C. K. McClelland; control of diseases of garden roses, by Rosen; rice diseases (stem rot and leaf spot), by Cralley and E. C. Tullis; and rice chlorosis, by Tullis and Cralley.

[Plant disease work by the New Haven Station] (*Connecticut [New Haven] Sta. Bul. 409 (1938), pp. 284–286, 287–291, 301, 302, 304, 315, 316*).—Progress reports are included on late blight of tomatoes; X disease of peach; apple spraying for the control of insect pests and diseases; sweetpotato diseases; cabbage yellows; bacterial wilt of corn; a new pepper disease associated with a *Verticillium*; muskmelon spray tests; potato spraying; chestnut blight; Dutch elm disease and its control; *Verticillium* wilt of maple; nematode injury to chrysanthemums; white pine blister rust; downy mildew of tobacco (first record for the State); tobacco mosaic; and pole rot of tobacco.

Plant pathology: Summary of accomplishments, C. E. Temple (*Maryland Sta. Rpt. 1937, pp. XXIX, XXX*).—Progress reports are given on wilt-resistant tomatoes and peas, improvement in the quality of pea stocks, and rotation for the control of pea diseases.

Plant pathology (*New Jersey Stas. Rpt. 1937, pp. 78, 79–83, 105*).—Progress reports are given on studies of potatoes, including the relative effectiveness of bordeaux mixture with and without spreaders and stickers, and seed and soil treatments for control of tuber-borne diseases; sweetpotato scurf control; seed dust for lima beans; study and control of cabbage club root; control of bacterial wilt of cantaloups; varietal tests for resistance to bacterial wilt of sweet corn; control of nematodes on greenhouse cucumbers; tests of hybrid eggplants for resistance to *Verticillium* wilt; control of lettuce drop; *Fusarium* bulb rot of onions; control of *Aphanomyces* root rot of peas; rhubarb root treatment for crown rot; tomato seed treatment; spray tests for apple diseases; determination of the time of maturity of apple scab ascospores; diseases of small fruits and their control; the principles and underlying cause of injury by copper fungicides; *Exobasidium* spp. on ericaceous fruits; turf disease control; control of maple wilt by fertilization; gladiolus scab control; masking of rose mosaic symptoms; *Septoria* spp. on chrysanthemum; *Sphaeropsis* twig blight of conifers; and mercury compounds, including Merthiolate, as seed disinfectants.

[Plant disease work by the South Carolina Station] (*South Carolina Sta. Rpt. 1937, pp. 42–46, 49–52, 106–108, 150, 151, 156–162, figs. 7*).—Progress is re-

ported on studies of various phases of the cotton *Fusarium* wilt problem, by G. M. Armstrong, J. D. MacLachlan, N. A. Schappelle, and C. H. Hollis; cotton seedling diseases and their control, by C. H. Arndt; control of tobacco blue mold, by W. M. Lunn and J. R. Mattison (coop. U. S. D. A.); potato blight control; and cucurbit diseases, including seed treatment, disease development, spraying and dusting tests, and cantaloup, muskmelon, and cucumber variety tests for quality and disease resistance, by C. J. Nusbaum.

[**Plant disease work at the Washington Station**]. (Partly coop. U. S. D. A.). (*Washington Sta. Bul. 354 (1937), pp. 52–57, 73*).—Reports of progress are included for wheat smuts (*Tilletia tritici* and *T. levis*), by F. D. Heald and C. S. Holton; the etiology and control of apple rots, by Heald and R. Wellman; pear rots, by Heald and H. English; forage grass diseases (particularly *T. levis*, *T. tritici*, *Ustilago bullata*, *U. bromivora*, and *U. lorentziana*), by G. W. Fischer; virus diseases of potato and other Solanaceae by L. K. Jones, of peas by Jones and F. Johnson, and of brambles by Jones; downy and powdery mildews of peas, by Jones and L. Campbell; mosaic, downy mildew, and leaf spot of alfalfa, by Heald and Wellman; black root and boron deficiency of sugar beet, by Campbell, Heald, and Jones; crinkle and mosaic diseases of geraniums, by Jones; a plant disease survey of the State, by Heald, Jones, and G. A. Huber; and the rosebloom disease (*Exobasidium oxycocci*) of cranberry.

Life span and morphology of fire blight bacteria as influenced by relative humidity, temperature, and nutrition, H. R. Rosen. (Ark. Expt. Sta.). (*Jour. Agr. Res.* [*U. S.*], *56* (*1938*), *No. 4*, *pp. 239–258*, *pls. 3*).—Fire blight bacteria, *Erwinia amylovora* (=*Bacillus amylovorus*), as droplets of natural exudate and as pure cultures were subjected to different combinations of relative humidity and temperature, varying from uncontrolled humidity and temperature (outdoors) to controlled conditions ranging from approximately 0 to 90 percent humidity and 16° to 40° C. Combinations of moderate or high temperatures and moderate or high humidities were found conducive to short life, while equally high temperatures with low humidities made for long life of the bacteria in the form of exudate. While neither the temperatures nor the relative humidities alone exercised a deleterious effect over relatively long periods, the data presented indicate that there is a very appreciable effect at higher temperatures when the relative humidities approach 45 percent. As pure, nutrient-agar cultures, the bacteria were short lived under temperature, humidity, and light conditions favorable to their life span in exudates. At 16°, bacteria in exudates were long lived at 0 to 45 percent relative humidity. At low humidity, the longevity of the bacteria within pieces of blighted host tissues was approximately equal to that in exudates. When droplets of exudate were immersed in honey contained in comb kept outdoors, the bacteria remained alive and infectious for 22 days. A morphological study of the bacteria from exudates indicates that they are enveloped in slimy, mainly nonproteinaceous capsules. In artificial cultures these capsules are greatly reduced or absent. It is concluded that the presence or absence of slimy envelopes probably exercises a considerable influence on the longevity of the bacteria and on their reaction to diverse conditions of temperature, humidity, and light. These bacteria, encased in slimy layers as they are in natural exudates, are believed to offer a fertile field of investigation as to the epidemiology of fire blight.

The relationships between liquid crystalline preparations of cucumber viruses 3 and 4 and strains of tobacco mosaic virus, F. C. Bawden and N. W. Pirie (*Brit. Jour. Expt. Path.*, *18* (*1937*), *No. 4*, *pp. 275–291*, *fig. 1*).—Methods are described for isolating nucleoproteins from cucumber plants infected with viruses 3 and 4. All available evidence indicated them to be the viruses them-

selves. Infections were obtained with 10^{-10} g, and specific precipitates with antiserum $1/8\times10^{-6}$ g. Concentrated solutions were spontaneously birefringent and dilute ones showed anisotropy of flow. When sedimented by high-speed centrifugation they formed birefringent jellies, and when precipitated by acid or ammonium sulfate they formed needle-shaped para-crystals. Although distinct in host range from tobacco mosaic virus, the purified preparations had similar chemical compositions and many properties in common with similar preparations of the tobacco virus, though differing from the latter more than its recognized strains differ from one another. The cucumber and tobacco viruses were shown to have common antigens, and the results of the cross-absorption tests are described and provisional antigenic formulas suggested. Possible methods of relating and distinguishing these viruses are discussed.

A comparison of X-ray inactivation rates in Drosophila and in tobacco mosaic virus, J. W. GOWEN. (Iowa State Col.). (*Genetics, 23 (1938), No. 1, p. 148*).—This is an abstract of a contribution.

Studies on cultural characteristics, physiology, and pathogenicity of strain types of Phytomonas stewarti, S. S. IVANOFF, A. J. RIKER, and H. A. DETTWILER. (Wis. Expt. Sta.). (*Jour. Bact., 35 (1938), No. 3, pp. 235–253, figs. 2*).—Studies of 22 single-cell cultures of *P. stewartii* [=*Bacterium stewarti*] inducing wilt in corn and other grasses showed conspicuous differences permitting their arrangement into three strain types (designated A, B, and C), which are described in detail as to colony characters, morphology, staining reactions, physiology, and pathogenicity. Perhaps the most conspicuous differences among these types lay in the color, shape, consistency, and size of the colonies, but no changes are suggested in the taxonomic status of the species on the basis of the results obtained. Certain culture types seemed to predominate during given seasons in some localities. A direct relation was indicated between the quantity of gum produced by certain cultures and their pathogenicity. It appeared that, in addition to the influence of environal factors, the more frequent local occurrence of highly pathogenic than of less pathogenic strains should be considered in relation to epidemics. It is believed that basic questions on pathogenicity may be advantageously approached with this organism.

Distribution, hosts and internal telia of Puccinia parkerae, C. R. STILLINGER (*Mycologia, 30 (1938), No. 2, pp. 235–242, figs. 2*).—The distribution of this rust is extended to eastern Washington State, northern Idaho, and British Columbia. It was found to be primarily specialized on *Ribes lacustre*, and *R. bracteosum*, *R. sanguineum*, and *Grossularia divaricata* are reported as new hosts. Internal telia were found in the fruit and stem of *R. lacustre*, stem and fruit infection of the host being reported for the first time.

Effect of low concentrations of copper on germination and growth of conidia of Sclerotinia fructicola and Glomerella cingulata, M. C. GOLDSWORTHY and E. L. GREEN. (U. S. D. A.). (*Jour. Agr. Res. [U. S.], 56 (1938), No. 7, pp. 489–505, fig. 1*).—The treatments reported were (1) by a "dynamic" system, consisting of a continuous supply of certain concentrations of copper ions for 24 hr. so controlled as to deliver the solutions to the test conidia embedded in water agar, and (2) by a "static" system, consisting of conidia similarly exposed to certain concentrations of copper ions added to water, Czapek's agar, and potato agar. In the first case the copper concentration was practically constant, in the latter it gradually decreased without being restored.

The conidia of both fungi were definitely injured by $CuSO_4$ solutions with ionic copper as low as 0.25 p. p. m. by the dynamic system, the toxicity being higher where the factors favoring inactivation or fixation were overcome than

in the static system. In the latter case the toxicity varied according to the power of the media to fix the copper ions, the amount fixed depending in turn on the character and composition of the media and apparently being greatly influenced by direct adsorption or by combination with alcohol hydroxyl groups. Primary saturated solutions of relatively insoluble copper compounds showed differences in toxicity apparently correlated with the amount of available copper rather than with the amount of soluble copper present. Similar solutions of cupric oxide (black), copper phosphate, copper zeolite, copper ammonium silicate, and copper silicate were nontoxic to conidia of the two fungi, and one of two copper oxychlorides was only slightly toxic to conidia of *S. fructicola* and nontoxic to those of *G. cingulata*. Like solutions of cuprous oxide (red), basic copper sulfate, one of the copper oxychlorides, copper maleate, and basic maleate were toxic to both. A similar solution of copper malate, with a copper solubility of 1,240 p. p. m., proved only slightly less toxic than a $CuSO_4$ solution with a copper concentration of 0.25 p. p. m. The primary saturated solution of copper oxalate proved to be only slightly toxic to *S. fructicola* conidia and innocuous to those of *G. cingulata*. Tests with dilute oxalic acid indicated this difference to be due to the specificity of the acid. Ionic copper in amounts sufficient to be toxic to *S. fructicola* conidia could be entirely inactivated by adding an equivalent amount of malic acid. The acid, at least in low concentrations, was assimilated by the conidia of both fungi, promoting growth.

Insoluble copper compounds as vegetable sprays, J. D. WILSON and H. A. RUNNELS (*Ohio Sta. Bimo. Bul. 191 (1938), pp. 48–55*).—Two copper chlorides (basic copper chloride and Cupro-K—a copper oxychloride), and Coposil (copper ammonium silicate), as used in the basic dust formula (1–8–1), are reported to have given excellent results on cucumbers and muskmelons and are recommended for these crops in preference to bordeaux mixture or copper-lime dust. The same materials used in the basic spray formula (4–4–50) increased the tomato yield when disease was severe enough to act as a retarding factor on fruit production. They are recommended as bordeaux substitutes for this crop (seedbed and field). These materials also compared favorably with bordeaux mixture on carrots, celery, and ginseng, but as yet can hardly be recommended for replacing bordeaux here because of their cost. A number of other insoluble copper compounds have also been tested and some have given good results in particular instances, but on the basis of results to date none of them can be as highly recommended for replacing bordeaux as can copper chloride, Cupro-K, and Coposil.

Notes concerning relative toxicity of the three halides of lithium upon green mold (Penicillium italicum), B. MELKON (*Amer. Jour. Pharm., 110 (1938), No. 2, pp. 56–63, figs. 2*).—The decreasing order of toxicity to a single-spore strain of *P. italicum* was found to be iodide, bromide, and chloride, thus showing increase in toxicity as the atomic weight of the halogen component increased. There was indication that the lithium component of the molecule is relatively nontoxic.

The "black-point" or "kernel smudge" disease of cereals, J. E. MACHACEK and F. J. GREANEY (*Canad. Jour. Res., 16 (1938), No. 2, Sect. C, pp. 84–113, pl. 1, figs. 2*).—This disease of wheat, rye, and barley frequently reduces the seed and usually also the sales value of affected grain. *Alternaria tenuis*, *A. peglionii*, *Helminthosporium sativum*, and *H. teres* were the fungi chiefly associated in Manitoba, and the kernel smudge caused by the two genera could not be accurately differentiated without laboratory examination. *H. sativum* was found to reduce germination, plant emergence, and yield, and to cause an increased amount of root rot in wheat, while the *Alternaria* type of kernel

smudge did not do so to any marked extent. Under Manitoba conditions kernel infection arises from air-borne spores. The disease does not result in shrunken kernels, the latter usually being free of infection. Apparently, the reason for this is that the glumes of small kernels remain closed and exclude the air-borne spores. The seed value of grain attacked by *H. sativum* was considerably increased when dusted with suitable organic mercury dusts. Copper carbonate dust proved relatively ineffective. The development of the disease in the maturing crop was not prevented by dusting the growing plants with sulfur. A bibliography of 53 references is given.

A mosaic-resistant small red bean, D. M. Murphy and W. H. Pierce. (Idaho Expt. Sta.). (*Phytopathology, 28 (1938), No. 4, pp. 270–273*).—Two new hybrid bean selections resistant to common bean mosaic (Red Mexican U. I. No. 3, and Red Mexican U. I. No. 34) have been introduced to Idaho bean growers. These selections were obtained from crosses of Great Northern U. I. No. 1 with Common Red Mexican, and were developed to replace Common Red Mexican, a variety very susceptible to this mosaic.

A mosaic disease of Chinese cabbage, C. M. Tompkins and H. R. Thomas. (Calif. Expt. Sta.). (*Jour. Agr. Res.* [*U. S.*], *56 (1938), No. 7, pp. 541–551, figs. 5*).—*A mosaic disease of Brassica pe-tsai, prevalent in central California during the fall and winter, is described. The symptoms consist of a systemic clearing of the veins followed by general mottling, with little or no leaf distortion.* In the greenhouse, transmission was obtained by mechanical inoculation with carborundum and also by the cabbage aphid (*Brevicoryne brassicae*) and the green peach aphid (*Myzus persicae*). Seed transmission tests were negative. The virus was infectious after storage for 3 days at 22° C., after a 10-min. treatment in a water bath at 73°, and after a 1–5,000 dilution. Local lesions were obtained on *Nicotiana glutinosa* and *N. tabacum*, but otherwise the host range was confined to the Cruciferae. Considered as to symptoms, the Chinese cabbage, cauliflower, and turnip mosaic viruses can be easily differentiated on Chinese cabbage, Winter Colma cabbage, and Purple Top White Globe turnip.

Combating corn diseases in Illinois, B. Koehler and J. R. Holbert. (Coop. U. S. D. A.). (*Illinois Sta. Circ. 484 (1938), pp. 36, pl. 1, figs. 22*).—This circular discusses particularly the selection of the strain of corn for planting and the care of the seed, and also describes and illustrates the principal diseases occurring in Illinois corn, viz, seedling diseases, common smut, black bundle disease, bacterial wilt, and root, stalk, and ear rots. The severity of attack by these diseases, in general, depends on the care with which the seed is chosen or selected, stored, and treated for disease infection, and the kind of weather during the growing and maturing season.

Fungus growth in shelled corn as affected by moisture, B. Koehler. (Ill. Expt. Sta.). (*Jour. Agr. Res.* [*U. S.*], *56 (1938), No. 4, pp. 291–307, figs. 5*).—*Shelled yellow dent corn was stored under constant moisture conditions at 70° F. for 3 mo. to determine the minimum grain moistures at which certain corn-rot fungi would grow. The fungus to be studied was supplied either by selecting corn carrying the fungus as an internal infection or by inoculating the grain. The growth limits were determined (1) in competition with surface-borne organisms and (2) in pure culture after surface sterilization of the grain.*

As to minimum requirements under one or the other of these conditions, *Aspergillus glaucus* grew at 14.3 percent grain moisture, *A. versicolor* at 15, *A. wentii* at 15.1, *A. ochraceus* and *Penicillium notatum* at 15.6, *P. viridicatum* at 17.6, *P. palitans* at 18, *A. flavus* and *A. niger* at 18.3, *Fusarium moniliforme* at 18.4, *A. tamarii* at 19.8, *P. oxalicum* and *P. expansum* at 20.8, *Diplodia zeae*

at 21.2, *Gibberella zeae* at 22.2, *Nigrospora sphaerica* at 22.5, and *Cephalosporium acremonium* at 23.4 percent grain moisture. Commercial damage developed at 1.5–2 percent moisture above the minimum growth requirement. The damage known as "blue eye" was found to be due to the fruiting of certain Penicillia between the germ and the seed coat. *P. notatum* caused blue eye at a minimum moisture of 16.7 percent, while *P. palitans* required 19.5, *P. oxalicum* and *P. expansum*, while causing rots at suitable moistures, failed to induce typical blue eye.

Establishment and spread of molds and bacteria on cotton roots by seed and seedling inoculation, M. B. Morrow, J. L. Roberts, J. E. Adams, H. V. Jordan, and P. Guest. (U. S. D. A.). (*Jour. Agr. Res.* [*U. S.*], *56* (*1938*), *No. 3, pp. 197–207, figs. 4*).—A study of plants from a field infested with *Phymatotrichum omnivorum* indicated that micro-organisms introduced with cottonseed or with inoculum furnished the seedling may become established in the rhizosphere. Three molds (*Aspergillus luchuensis, Penicillium luteum*, and *Trichoderma lignorum*) and two bacteria (*Pseudomonas fluorescens* and *Achromobacter radiobacter*) antagonistic to *Phymatotrichum omnivorum* in laboratory culture were used. Recovery of the two bacterial species was considered uncertain, but the results showed that when these molds were introduced around the root system they in many cases became established there. At any rate the introduced organisms were recovered in appreciably larger numbers from inoculated than from uninoculated plants.

Evaluation of some soil fungicides by laboratory tests with Phymatotrichum omnivorum, W. N. Ezekiel. (Tex. Expt. Sta.). (*Jour. Agr. Res.* [*U. S.*], *56* (*1938*), *No. 8, pp. 553–578, fig. 1*).—Methods are described for the laboratory evaluation of fungicides as to soil permeation and as to fungistatic and fungicidal effectiveness against *P. omnivorum*. When mixed mechanically into the soil, the initial fungistatic effectiveness of ethyl mercury materials was much higher than expected from their mercury content, but residual values after 5 weeks' contact with moist soil were in line with those of other compounds. When applied on the surface of Houston black clay soil in closed jars, pantachloroethane, tetrachloroethane, xylene, CS_2, turpentine, perchloroethylene, trichloroethylene, and dichloroethylene, at only 100 p. p. m. of the airdry soil weight, completely inhibited growth from inoculum 135 mm deep. Formaldehyde, on the other hand, was ineffective even at 4,000 p. p. m., and ammonia failed to prevent growth from deep inocula even at 10,000 p. p. m. The tested organic mercury compounds prevented growth from inocula near the surface, but not from deeper inocula. When inocula were inserted deep in the soil in closed jars several weeks after surface application of pentachloroethane, 4–8 weeks' contact with moist soil reduced the fungistatic effectiveness to 0.1–0.2 of the original value. Pentachloroethane, tetrachloroethane, and xylene, applied at only 100 p. p. m. on the surface of Houston soil in closed jars, proved quite effective in preventing growth from inocula buried in the soil, but higher concentrations (500–1,000 p. p. m.) were necessary under more adverse conditions. With open jars there appeared to be considerable advantage in inserting fungicides in holes below the surface rather than in applying them on the surface.

The actual toxicity of volatile materials was determined by a method requiring the fungicides to volatilize through air and through cotton plugs before contacting the inocula. Pentachloroethane, tetrachloroethane, xylene, and ammonia proved most toxic in these tests. Pentachloroethane, tetrachloroethane, and xylene showed ability to penetrate moist soil and prevent

growth of *P. omnivorum*, together with high fungicidal value after passage through air, and are suggested as promising soil fungicides for field trials.

Tests with pentachlorethane, tetrachlorethane, and xylol to determine their efficiency in eradication of Phymatotrichum root rot, W. N. EZEKIEL. (Tex. Expt. Sta.). (*Jour. Agr. Res.* [*U. S.*], *56* (*1938*), *No. 8, pp. 579–593, figs. 3*).—In field tests against root rot these three fungicides were applied in holes in the soil 6 in. deep and covered only by pushing soil into the holes. They were applied first in small plats around infected cotton plants and chinaberry and elm trees. *Roots excavated after various periods from plats treated at 166 g per square foot yielded growth from only 1 of 253 portions; at 83 g per square foot, from 2 of 210 portions; at 41.5 g per square foot, from 7 of* 79 portions; and untreated check plats, from 92 of 293 portions. The fungicides were effective to at least 2 ft. below the depth at which applied. Xylol and tetrachloroethane were also applied at 249 g per square foot over infested plats bordered by "sorghum barriers" to prevent reencroachment. The root rot incidence was markedly delayed and its prevalence reduced during the season following treatment, but the disease recurred in each plat from isolated centers of infection.

Applications around growing trees and shrubs indicated tetrachloroethane to be rapidly and severely injurious, xylol next, and pentachloroethane least injurious. Applications at 166 or 83 g per square foot injured some of the plants, but no injury was found after treatment at 41.5 g per square foot. *Of the plants tested, the decreasing order of susceptibility to fungicide injury was live oak, elm, ilex, hawthorn, hackberry, pomegranate, and retama.* Residual injurious effects on subsequent crops were much more severe after soil treatment with tetrachloroethane than with xylol.

Failure of tetrachloroethane and xylol to eradicate root rot completely from infested plats was possibly due more to their loss from the surface soil than to their failure to be sufficiently fungicidal or to penetrate the soil adequately. Further tests are needed before these soil fungicides can be recommended for practical use.

Studies on the cause of immunity of monocotyledonous plants to Phymatotrichum root rot, W. N. EZEKIEL and J. F. FUDGE. (Tex. Expt. Sta.). (*Jour. Agr. Res.* [*U. S.*], *56* (*1938*), *No. 10, pp. 773–786, figs. 2*).—Root rot due to *P. omnivorum* is known to attack 1,708 gymnosperms and dicots, while monocots are immune. In this study ether extracts of juices from roots of monocots were potent in preventing growth of the fungus, while those from *roots of susceptible dicots were not. Aqueous residues of juices from susceptible as well as immune plants proved potent when tested in the culture solutions.* In ether extracts from all *monocots tested, potent material was* found in a fraction soluble in ether, in acetone, and in aqueous Na_2CO_3 solution, from which it could be recovered in ether after slight acidification, but not in water. Fractions of this kind were ±100 times as potent on a dry-matter basis as the original juice, and prevented growth of the fungus when added to nutrient solutions in amounts supplying 0.02–0.09 percent of plant material. Such fractions were prepared from onion bulbs, gladiolus corms, and from giant reed, canna, *Hemerocallis*, and Johnson grass roots. Onion juice contained an additional potent fraction, insoluble in NA_2CO_3 solution but apparently slowly saponifiable in alcoholic KOH. Ether fractions from susceptible dicots (e. g., carrots, beets, and sweetpotatoes) were uniformly nonpotent. However, the less susceptible potato and turnip yielded potent ether fractions. These factors may be associated with differences in susceptibility to root rot of various dicot families and species.

It is concluded that the general immunity of monocots to root rot is due at least in part to the presence in the roots of minute quantities of acidic, ether-soluble substances, possibly organic acids or esters.

Fusarium wilt of muskmelons in Minnesota, J. G. LEACH and T. M. CURRENCE (*Minnesota Sta. Tech. Bul. 129 (1938), pp. 32, figs. 18*).—This destructive wilt, observed in the State in 1931, is said to be a limiting factor in muskmelon production in certain local areas and apparently to be spreading from the original centers. The disease picture and the pathogen were found to be closely similar to those involved in watermelon wilt. However, the fungi were not cross inoculable, and the muskmelon pathogen is thus presented as form 2 of *F. bulbigenum niveum*, for which a technical description is given. Muskmelon wilt appears to occur also in New York, Michigan, and Arizona, and perhaps in other sections of the United States, and in Ontario and on Vancouver Island. It is apparently new or of recent introduction, and in all observed cases its distribution has been relatively localized. It has proved most destructive in the cooler soils and in early planted melons. The temperature relations of pathogen and host are presented in detail. The resistance at higher soil temperatures appears to result from a rapid periderm formation about the vascular elements, preventing the fungus from penetrating the stele. Infection may apparently occur through any underground part not fully protected by a periderm. Where the plants wilt after fruits have formed, the fungus is often found to have extended into the melon, where it penetrates under the seed coat but not into the embryo.

Control at present depends on use of noninfested soil and clean seed. Varieties locally grown in the State appear to have little or no resistance, but Honeydew, Honeyball, Persian, and Casaba seem to be relatively resistant though not adapted to Minnesota conditions. However, promising new varieties of early maturity, good quality, and high resistance have been obtained by selection from progenies of a hybrid between the Honeydew and Golden Osage varieties. Green- and yellow-flesh types have appeared in these resistant hybrids, but further selection and inbreeding are necessary before they will be ready for distribution.

Inheritance of resistance to loose and covered smuts in Markton oat hybrids, G. M. REED and T. R. STANTON. (U. S. D. A. et al.). (*Jour. Agr. Res. [U. S.], 56 (1938), No. 3, pp. 159–175, figs. 3*).—The results are presented from five oat hybrid combinations involving crosses of Markton (very resistant) with varieties differing in behavior to the Missouri races of loose and covered smuts. The crosses are grouped according to the reaction of the variable parent as (1) susceptible to both smuts, (2) susceptible to loose and resistant to covered smut, and (3) the reverse of (2). The four crosses, Canadian, Early Champion (and its reciprocal), and Victor × Markton all fell into group (1). In inoculations of *Ustilago avenae* the infections in F_2 plants ranged from 8.6 to 16 percent, those of *U. levis* from 20 to 32.5 percent. In inoculations of F_3 progenies with these smuts there was no agreement in reaction. The data for both F_2 and F_3 with loose smut may suggest a two-factor difference, those for covered smut a single-factor difference. In both series there was a noticeable lack of fully susceptible progenies.

In the second type of cross, Gothland × Markton, the F_2 plants inoculated with loose smut gave 17.1 percent infection. In the F_3, 72.6 percent of the F_3 progenies from uninoculated F_2 plants were segregating, while the others were resistant. No fully susceptible progenies were noted. Although both parents were resistant to covered smut, there were a few infected F_2 plants and F_3 progenies.

In the third group, Monarch × Markton, although the parents were resistant to loose smut, a few F_2 plants and F_3 progenies were infected. With covered smut, 22 percent of the F_2 plants were infected, and 74.4 percent of the F_3 progenies from uninoculated F_2 plants contained smutted individuals. These data may suggest a single-factor difference, but there was a noticeable lack of susceptible F_3 progenies.

A streak disease of peas and its relation to several strains of alfalfa mosaic virus, W. J. Zaumeyer. (U. S. D. A.). (*Jour. Agr. Res. [U. S.], 56 (1938), No. 10, pp. 747–772, figs. 5*).—This new virus disease, together with a comparison of three alfalfa mosaic strains infectious to pea, bean, and other legumes, is described and identified. Differentiation was based on the expression of symptoms produced on numerous hosts, varietal resistance of peas and beans, host range, and properties of the viruses in vitro. Pea streak virus 1 produced a streaking of the stems, the petioles, and the main veins of the leaves of the pea, but no leaf mottling. All three alfalfa viruses produced a leaf mottling, and in addition alfalfa mosaic virus 1B caused a spotting of the leaves and a slight streaking of the stems. Seventeen varieties were susceptible to pea streak virus 1. Horal was the only variety immune to the three alfalfa viruses. Pea streak virus 1 was not infectious to bean, whereas the alfalfa viruses produced local necrotic lesions. The host range of the pea streak virus is more limited than that of the three strains of alfalfa virus. Pea streak virus 1 failed to infect any species outside of the Leguminosae. The thermal inactivation point, resistance to aging in vitro, and tolerance to dilution were determined for all these viruses. It is believed that the differences among the several viruses here reported, as well as among other legume viruses, will be found sufficient to permit identification and classification.

Two fungi causing leaf spot of peanut, W. A. Jenkins. (Ga. Expt. Sta.). (*Jour. Agr. Res. [U. S.], 56 (1938), No. 5, pp. 317–332, pl. 1, figs. 5*).—Through a three-season study of the morphology and life history of the two destructive peanut leaf spot fungi heretofore known as *Cercospora arachidicola* and *C. personata*, it was found that each fungus produces spermogonia and perithecia, as well as conidia. *Mycosphaerella arachidicola* n. sp. is proposed for the perithecial stage of *C. arachidicola* and *M. berkeleyii* n. sp. for that of *C. personata*. In both fungi spermogonial and perithecial development is initiated during early fall. The spermogonia mature and (usually) cease liberating spermatia by February. The perithecia do not mature until late spring. Further evidence is presented that the spermatia function as male sexual elements in perithecial production.

During the years under observation, the leaf spot due to *M. arachidicola* has been for the most part more widespread than that due to *M. berkeleyii*. It also reaches epiphytotic proportions during August and early September, whereas that due to *M. berkeleyii* is most destructive from September through harvest. In Georgia, *M. arachidicola* usually causes the most damage to Spanish peanuts, since they are usually harvested before *M. berkeleyii* reaches epiphytotic proportions.

Influence of rotations under irrigation on potato scab, Rhizoctonia, and Fusarium wilt, R. W. Goss and M. M. Afanasiev (*Nebraska Sta. Bul. 317 (1938), pp. 18, figs. 6*).—The other crops in these rotations (1–7 yr. long, and started in 1912) were sugar beets, corn, oats, and alfalfa. The data (1929–1936) were obtained by sampling the harvested crop and examining the tubers for each of these seed-borne diseases, and records were also kept of the summer development of *Fusarium* wilt in the field. Scab proved to be most severe in

the short rotations with sugar beets and least so in the long (4–6 yr.) rotations with alfalfa preceding potatoes. Barnyard manure in the short rotations led to scab increases, but the total yields were so greatly increased that more marketable tubers were produced in spite of more scab. *Rhizoctonia* was most severe with continuous potato culture and in the short rotations, while very little occurred in the long rotations with alfalfa. Barnyard manure in the short rotations decreased the percentage of *Rhizoctonia*-infected tubers. The highest percentage of *Fusarium* wilt occurred in the 2-yr. rotation with corn. Continuous potato culture and short rotations with grain gave more *Fusarium* wilt than the longer rotations with alfalfa preceding potatoes, in the latter case the infection being low. Judged by foliage symptoms, *F. solani cumartii* was responsible for the greater part of the *Fusarium* wilt, which was most evident in the field during the first half of September. The percentage of tubers with symptoms in the bin closely paralleled that of infected plants in the field.

As to both yields and diseases, the best rotations are believed to be those with alfalfa preceding potatoes, with 3–6 yr. intervals between potato crops. With short rotations use of manure is advised, while with *Fusarium* wilt a problem, corn preceding potatoes is recommended.

Studies on Rhizoctonia solani Kühn.—III, Racial differences in pathogenicity, G. B. Sanford (*Canad. Jour. Res., 16 (1938), No. 2, Sect. C, pp. 53–64, pl. 1*).—Continuing this series (E. S. R., 78, p. 351), of the pathogenicity tests made on potato stems with 133 isolates, 112 were from random sclerotia on random tubers from 4 fields, 13 from potato-stem lesions, and 8 from single basidiospores. A number of laboratory tests were made at 17° and 23° C. in two contrasting types of artificially infested, unsterilized, virgin soil maintained at optimum moisture content for disease expression.

More of the isolates proved pathogenic in the infertile podsol soil than in the fertile black loam, 18 percent of them being virulent in the latter as compared with 34 percent in the former soil. The indications were that, under average soil conditions, about 20–50 percent of the isolates from sclerotia on random tubers may be assigned to the zero and marginal classes of pathogenic rank. Certain isolates were inherently very deficient in pathogenicity to potato stems, while others characteristically possessed a high degree of virulence. The results of this study may aid in explaining why the stems of a high percentage of plants from sclerotium-infested sets often escape with little or no field infection.

Rhizoctonia sheath spot of rice, T. C. Ryker and F. S. Gooch. (La. Expt. Sta.). (*Phytopathology, 28 (1938), No. 4, pp. 233–246, figs. 6*).—This common disease of rice in Louisiana, found to be consistently associated with a *Rhizoctonia* distinct from any species hitherto described, is apparently identical with that described by Tullis as due to *Trichoderma lignorum* (E. S. R., 73, p. 58). The disease also resembles a sheath spot of rice prevalent in certain Oriental countries, the cause of which has been described both as *R. solani* and as *Hypochnus sasakii*. The Louisiana fungus, characterized by salmon-colored sclerotia in culture, is described as *R. oryzae* n. sp. Typical sheath spotting was induced by placing its mycelium in contact with leaf-sheath tissue and also by placing it on the soil surface in which rice was growing. Besides *R. oryzae*, *R. solani*, *R. zeae*, and *Trichoderma* spp. were occasionally isolated from sheath-spotted rice, and typical symptoms were produced by inoculating *R. solani* (cultures from Louisiana, China, and the Philippines) and *R. zeae*. From numerous inoculations with *Trichoderma* spp. no infections were obtained.

Determining the sclerotial population of Sclerotium rolfsii by soil analysis and predicting losses of sugar beets on the basis of these analyses, L. D. Leach and A. E. Davey. (Calif. Expt. Sta.). (*Jour. Agr. Res.* [*U. S.*], *56* (*1938*), *No. 8, pp. 619–631, figs. 4*).—It is reported that the degree of infestation in sugar beet fields can be determined before planting by examination of soil samples. These are washed through a series of screens, the sclerotia recovered, and their germinability determined by incubation at 30° C. on the surface of nonsterilized peat soil in Petri dishes. The population is expressed as the number of viable sclerotia per square foot of soil to the depth of 8 in. The number in the soil was found to increase in proportion to the percentage of sugar beet infection. Following 50 percent infection, as many as 5,000 sclerotia per square foot have been found. Culture of nonsusceptible crops (e. g., wheat or barley) or winter crops (e. g., peas) resulted in rapid reductions of sclerotia. The percentage of infection on subsequent sugar beet plantings showed a high correlation with sclerotial population. During 1936, over 1,500 acres were indexed by this method in advance of planting to identify severely infested fields.

Tobacco diseases in 1937, P. J. Anderson (*Connecticut* [*New Haven*] *Sta. Bul. 410* (*1938*), *pp. 406–413, figs. 5*).—Seasonal observations and/or progress reports are included on downy mildew (E. S. R., 78, p. 648), malformations of seedlings in the seedbed (cause unknown), bed rot (*Rhizoctonia*, etc.), wildfire, sore shin (*Rhizoctonia*, etc.), an unusual outbreak of hollow stalk wet rot (*Bacillus carotovorus* = *Erwinia carotovora*), pole rot, bundle rot (apparently due to an *Aspergillus*), and brown spot and "firing" of broadleaf tobacco associated with the *Alternaria tenuis* responsible for pole rot in the curing sheds.

The protein content of mosaic tobacco, L. F. Martin, A. K. Balls, and H. H. McKinney (*Science, 87* (*1938*), *No. 2258, pp. 329, 330*).—Using the trypsin-digest method previously noted (E. S. R., 78, p. 649) on three tobacco varieties and three mosaics, it is concluded that irrespective of disease severity the total nitrogen of the plants is very little changed from normal, that the total protein seems also to have undergone very little if any change (suggesting that the virus protein is produced at the expense of the normal protein), and that for common mosaic the trypsin-resistant protein, regarded as virus protein, exists in smaller proportion than previously supposed. The amount of resistant protein was greater in susceptible than in less vulnerable varieties. As yet there is no proof that the yellow mosaic virus is resistant to trypsin.

The effect of certain potato and tobacco viruses on tomato plants, G. Burnett. (Wash. Expt. Sta.). (*Wash. State Col., Res. Studies, 5* (*1937*), *No. 4, pp. 219–221*).—This is an abstract of studies previously noted (E. S. R., 66, p. 749; 71, p. 657).

Botrytis cinerea Pers. in relation to tomatoes grown under glass, T. W. Bretz (*Ohio State Univ., Abs. Doctors' Diss., No. 24* (*1937*), *pp. 21–28*).—From this study of the morphology, physiology, and pathogenicity of pure cultures of the fungus, it was found that the stem, foliage, blooms, and fruit of greenhouse tomatoes may become infected, though the most obvious loss is from the fruit rot. Practices permitting moisture to remain on the leaves for extended periods favor outbreaks of infection, as do night temperatures appreciably lower than those during the day.

The relation between water deficiency and blossom-end rot of tomatoes, I. C. Hoffman (*Ohio State Univ., Abs. Doctors' Diss., No. 24* (*1937*), *pp. 163–171*).—This is an abstract of a study in which it seemed clear that a water deficit within the plant is the principal cause of this malady of greenhouse tomatoes.

Field experiments on bunt of wheat, G. H. Starr (*Wyoming Sta. Bul. 226* (*1938*), *pp. 23, figs. 7*).—Bunt was present in nearly all the tests undertaken (1932–36), that due to *Tilletia levis* being far more common in the State than the one caused by *T. tritici.* Ceresan and formaldehyde proved to be the most efficient of the fungicides tried for controlling seed-borne bunt, but with the danger of seed injury from the latter. Copper carbonate and Coppercarb in general gave fairly similar results, but neither was as effective as the other two fungicides. Bunt averaged 78.3 percent in the early plantings, becoming progressively less in subsequent sowings down to an average of 11.5 percent in the late ones. Temperature relations thus appear to be very important for bunt development. In general, more bunt developed in irrigated than in nonirrigated plats, averaging 37.6 percent in the former and 26.9 percent in the latter. There was little evidence of bunt from soil infestation, except possibly in 1935.

A cytological study of host-parasite relations of Venturia inaequalis on apple leaves, C. J. Nusbaum and G. W. Keitt. (Wis. Expt. Sta.). (*Jour. Agr. Res.* [*U. S.*], *56* (*1938*), *No. 8, pp. 595–618, pls. 3, figs. 4*).—Two monoconidial isolates on the leaves of three apple varieties were used in this study (cleared-leaf and cytological technics). The six isolate-variety combinations employed showed four distinct host-reaction types, viz, very susceptible, intermediate, and two resistant types. Spore germination, formation of appressoria or functionally equivalent structures, and direct cuticle penetration occurred in all cases, without perceptible influence by isolate-variety combinations. A very tenuous infection hypha emanated from a minute pore surrounded by a circular thickening in the basal wall of the appressorium or its functional equivalent, and pierced the cuticle without visible change in the thickness or staining reaction of the latter. The distal end enlarged to form a primary hypha on reaching the cellulose wall, and the fungus developed beneath the cuticle in close contact with the outer epidermal walls. In very susceptible leaves the host cells showed little abnormality until about 10 days after inoculation, when progressive depletion of plastids and cytoplasm, attended by increasing vacuolation, began to appear in the upper palisade at the lesion center. This impoverishment gradually spread throughout the area underlying the fungus, and was followed by necrosis. The fungus showed no apparent injury until the host cells had died. In intermediately susceptible leaves the fungus developed less vigorously, impoverishment of the host cells was less rapid and severe, and little necrosis occurred. In resistant leaves, the fungus growth was sharply restricted, the resistant variety employed showing hypersensitiveness to one isolate but not to the other.

The resistance of young leaves is attributed primarily to relations of the fungus and materials emanating from the host tissues, rather than to mechanical barriers. It is shown that in suitable isolate-variety combinations the fungus, though confined to the subcuticular position, is able to derive its nourishment efficiently from the underlying host tissues and to incite a wide range of pathological effects therein. In its mode of penetration of the cuticle, diversity of isolate-variety reactions, and ability to live efficiently for many weeks in intimately balanced relations with the living cells of a congenial host, *V. inaequalis* is considered to be strikingly similar to many of the so-called obligate parasites, and the subcuticular invaders of its type are regarded as a distinctive group among the higher parasites.

The value of new copper sprays as fungicides for the control of apple blotch, cherry leaf spot, and apple scab, 1937, K. J. Kadow and H. W. Anderson (*Phytopathology, 28* (*1938*), *No. 4, pp. 247–257, figs. 3*).—Experiments

were conducted in various parts of Illinois to determine the value of several insoluble copper sprays as possible bordeaux substitutes. The comparisons involved materials whose active ingredients were copper sulfate, basic copper sulfate, copper phosphate, copper oxychloride, cuprous oxide, copper hydroxide, and liquid lime-sulfur. All were studied in connection with the control of apple blotch *Phyllosticta solitaria* and scab *Venturia inaequalis*, and cherry leaf spot *Coccomyces hiemalis*, and with injuries from their use. The 1937 season was especially favorable, since the spray injuries and diseases were severe. Several materials proved satisfactory for apple blotch control, while only bordeaux 34 (basic copper sulfate) used with zinc sulfate and lime, Cupro-K (copper oxychloride), and liquid lime-sulfur were effective for cherry leaf spot control. No copper spray tested could be used without causing russet at any time in the Illinois apple scab schedule, although all but one of the materials controlled scab.

Some of the new copper fungicides appear to have definite promise as bordeaux substitutes, but not many of them are safe for fruit tree spraying as now recommended. Some of the products causing spray injury could undoubtedly be rendered safe without materially affecting their fungicidal value. A few of the products that do appear to be safe as now recommended need further study to determine satisfactory concentrations for use against the various diseases.

A laboratory method for testing the toxicity of protective fungicides, H. B. S. Montgomery and M. H. Moore (*Jour. Pomol. and Hort. Sci., 15 (1938), No. 4, pp. 253–266, pl. 1*).—The method described was developed for testing fungicides against apple scab, and involved the use of conidia of the imperfect stage. The literature of the subject is reviewed.

Dothiorella fungus in frozen avocado trees, W. T. Horne. (Calif. Expt. Sta.). (*Calif. Avocado Assoc. Yearbook, 1937, pp. 154, 155, figs. 2*).—Field observations reported in this note from the Citrus Substation suggest that development of the fungus has been favored by an increased retention of moisture in and on frozen twigs. It appeared that, so far as *Dothiorella* is concerned, dead wood may be removed up to the time when the next crop is liable to infection, and early removal will presumably be desirable.

Spotting of figs on the market, C. Brooks and L. P. McColloch. (U. S. D. A.). (*Jour. Agr. Res. [U. S.], 56 (1938), No. 7, pp. 473–488, figs. 12*).—Fig spotting was found to be caused mainly by *Alternaria tenuis*, but *Cladosporium herbarum* was occasionally found in infected tissues. Lowering the humidity in storage decreased the spotting, but humidities giving satisfactory control induced shriveling. The growth rate of the *Alternaria* on potato-dextrose agar was approximately twice as great at 77° as at 59° F., nearly three times as great at 59° as at 41°, and fully three times as great at 41° as at 32°. At 41°, 50°, 59°, 68°, and 77°, exposure to 30 percent of CO_2 reduced the activity of the *Alternaria* to about one-third of normal. With temperature conditions somewhat less satisfactory than those usually found during the first 2 days in a nonprecooled car, exposure to atmosphere in which the CO_2 averaged 23 percent or more gave as good control of spotting as immediate storage at 32°.

Algal fruit spot of orange, J. R. Winston (*Phytopathology, 28 (1938), No. 4, pp. 283–286, figs. 2*).—The citrus disease found to be due to the alga *Cephaleuros (virescens) mycoidea* is said to be fairly common on the Florida coastal lowlands but rare on the dry sand hills of the interior. It is manifest through dark, slightly raised blemishes with irregular to acutely pointed margins suggestive of lateral rootlike developments. There was no evidence that these lesions contributed to decay. Limb and twig infections also occurred. Possible contributing factors are suggested.

Control of the begonia leaf-blight nematode, E. F. GURA and C. J. GILGUT (*Massachusetts Sta. Bul. 348 (1938), pp. 12, figs. 4*).—In the culture of Lady Mac, Melior, and Marjorie Gibbs begonias, a large enterprise in many Massachusetts floricultural establishments, *Aphelenchoides fragariae* (=*Aphelenchus olesistus*) is often a serious menace. Sanitary and cultural methods alone have not proved effective. but when coupled with propagation from uninfested stock, satisfactory control has been obtained. All nematode stages in the leaves were killed by submerging potted infested plants in water of a mean temperature of 115° F. for 5 min., 117° for 3 min., 118.5° for 2 min., or 120.5° for 1 min. In general, 123°–120° for 1 min., 118°–115° for 3 min., or 115°–113° for 5 min. proved safe except to infested leaves, which were severely injured. In a few instances, traces to a very small number of nematodes revived, but either no further symptoms of disease appeared or the amount after 3 mo. was negligible. Untreated stock continued to show infested leaves and ultimately the contrast was striking. Submersion at 121°–120° for 1 min., 119°–117° for 2 min., or 118°–115° for 3 min. is recommended for infested stock, treatments to be tried on a few plants first. As an eradicative control measure, the submersion should be done at least 3 mo. before the marketing season to permit development of well-foliaged plants, but treatment of small plants earlier in the season, when an infestation first becomes noticeable, would be even more practical. Leaves for propagation tolerate water baths of these temperature-intervals, and the treatment of healthy leaf-cuttings from infested or unfamiliar outside sources during the winter propagating season is recommended.

Forest pathology, J. S. BOYCE (*New York and London: McGraw-Hill Book Co., 1938, pp. X+600, figs. 216*).—This volume was designed for use both as a textbook and a reference work. The sequence of diseases due to pathogens follows roughly the life of the tree from the seedling to the veteran class, the subject matter being treated under the headings of disease; the fungi; noninfectious diseases; seedling diseases; root diseases; foliage diseases of hardwoods, and of conifers; stem diseases, including rusts and cankers of conifers, cankers of hardwoods, galls and witches' broom, dieback and wilts, decay, and those stem troubles due to mistletoes, dwarf mistletoes, epiphytes, and climbers; the rots; deterioration of dead timber and of forest products, including decay and sap stains; and the principles of forest-disease control. Appendixes give formulas for fungicides and list alphabetically the common names of plants used, with their scientific equivalents. A subject index is provided, and literature references appear at the end of chapters.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Preliminary reconnaissance of the land vertebrates of the Archer and Anna Huntington Wild Life Forest Station, C. E. JOHNSON (*Roosevelt Wild Life Bul. [Syracuse Univ.], 10 (1937), No. 1, pp. 556–609, figs. 16*).—This report of the reconnaissance of an area of approximately 13,000 acres, situated near the village of Newcomb in the central Adirondacks, gives a general description of the area and reports upon observations of amphibians, reptiles, birds, and mammals.

Human and physical resources of Tennessee.—IV, Wild life, C. E. ALLRED, S. W. ATKINS, and B. D. RASKOPF (*Tenn. Agr. Col., Agr. Econ. and Rural Sociol. Dept. Monog. 42 (1937), pp. [1]+V+37–52, figs. 4*).—A survey of the wild animals of Tennessee, their number, occurrence, economic importance, and conservation is reported upon. The mammals of the State are said to be represented by at least 56 forms, the birds by 293, fish by 91, turtles by 17, frogs

and toads by 12, snakes by 39, and lizards by 6 forms. A list is given of 41 references to the literature.

Pocket mice of Washington and Oregon in relation to agriculture, T. H. SCHEFFER (*U. S. Dept. Agr., Tech. Bul. 608 (1938), pp. 16, pls. 5, fig. 1*).—Field studies of pocket mice (*Perognathus lordi* and *P. parvus*) conducted at Lind and near Kennewick, Wash., are reported, the details being presented in three tables. Both of these species have greatly increased in numbers since the original sagebrush cover has given place to scant-crop wheatfields and introduced weeds. In the investigations the relations of the pocket mice to other mice in the same district, including *Peromyscus*, *Onychomys*, and *Reithrodontomys*, were made a secondary objective. Extensive trapping was carried on in the course of intermittent field trips over a period of 3 yr., and hibernation studies were undertaken in the field and with captive animals both in eastern and in western Washington. *Perognathus*, as observed, does not hibernate but stores food and remains in seclusion in midwinter. Breeding is in midsummer, and some of the females raise a second litter. Damage to agricultural interests by the increase of pocket mice is often annoying, sometimes serious; but the species considered are not likely ever to become a plague, because of a moderate average litter of young (about five for *P. lordi*) and a short breeding season.

The prebaited feeding-station method of rat control, R. E. DOTY (*Hawaii. Planters' Rec. [Hawaii. Sugar Planters' Sta.], 42 (1938), No. 1, pp. 39–76, pls. 3, figs. 17*).—A so-called prebaited feeding-station plan of control for field rats is described. It consists of feeding unpoisoned grain placed in containers under a cover and exposed for several days (6 days or more), until a large part of the surrounding rat population has discovered the new source of food and has formed the habit of visiting such feeding places. The method has been found to be effective and economical in poisoning rats in large field areas. One round of poisoning is made for as low as 30 ct. per acre. Rolled oats are the most satisfactory of the baits tested, and the sweetening of the poisoned bait is of definite benefit. A concentration of thallium sulfate 1 part in 200 parts in the poisoned bait is sufficient for the prebaited feeding stations. The best attractants found were corn oil, raw linseed oil, and coconut oil, their effectiveness being in the order mentioned. One qt. of oil is sufficient for from 10 to 15 lb. of rolled oats.

The birds of America, J. J. AUDUBON (*New York: Macmillan Co., 1937, pp. XXVI, pls. [501]*).—These reproductions of colored plates from Audubon's Birds of America are accompanied by legends giving their range, habitat, identification, voice, nesting, and food. A transcript of the legends on the original plates, with a note concerning them, and an index of common names in the present text and on the original plates are included. The introduction and descriptive text are by W. Vogt.

Study of artificial incubation of game birds, III, IV, A. L. ROMANOFF (*[New York] Cornell Sta. Bul. 687 (1938), pp. 30, figs. 12*).—Further reports in this study (E. S. R., 72, p. 651) are presented.

III. *Effect of air movement on the incubation of pheasant and quail eggs* (pp. 5–14).—Studies have led to the conclusion that, in general, pheasant eggs are less sensitive both to a high rate of movement of air and to a great difference in temperature between the top and the bottom of the egg than are quail eggs. "Both pheasant and quail eggs are sensitive to a high rate of movement of air during the latter part of incubation and to a great difference in temperature between the top and the bottom of the egg during the early part of incubation. The high rate of movement of air in the incubator up to

5 miles per hour is undesirable for pheasant eggs and disastrous for quail eggs during the latter part of incubation. The great difference in temperature between the top and the bottom of the egg, up to 5° F. for every inch of elevation, is not desirable for pheasant eggs and is disastrous for quail eggs during the early part of incubation. In the practice of artificial incubation of pheasant eggs, it would seem advantageous to incubate them in an agitated-air type of incubator and then transfer them for hatching into an incubator of the still-air type. In the practice of artificial incubation of quail eggs, it would seem advantageous to both incubate and hatch them in a slow-agitated-air type of incubator."

IV. Interrelation of temperature, humidity, and air movement in the incubation of pheasant and quail eggs (pp. 15–30).—The author's study has shown that there is a definite, yet specific-to-species, relationship among the three important physical factors of incubation—temperature, humidity, and air movement. "There should be a proper adjustment of incubation conditions in respect to temperature and humidity according to the rate of air movement in the incubator. The proper adjustment of temperature and humidity allows the more extensive use of agitated-air-type incubators for greater efficiency of operation in the hatching of pheasant and quail eggs. Pheasant eggs that have been incubated for the first 20 days in an agitated-air-type incubator may thereafter be hatched most successfully in a still-air-type incubator with a slightly lowered temperature (about 0.5° lower) and relative humidity (about 3 to 5 percent lower) from the average conditions recommended for the type of incubator for continuous incubation and hatching. Quail eggs may be incubated and hatched most successfully in an agitated-air-type incubator, provided that with an increase of air movement there is a corresponding increase in both temperature (up to 0.25° higher) and relative humidity (about 2 to 3 percent higher)."

Fishes of the American Northwest: A catalogue of the fishes of Washington and Oregon, with distributional records and a bibliography, L. P. SCHULTZ and A. C. DELACY (*Mid-Pacific Mag., 48 (1935), No. 4, pp. 365–380; 49 (1936), Nos. 1, pp. 63–78; 2, pp. 127–142; 3, pp. 211–226; 4, pp. 275–290*).—This contribution is divided into six parts as follows: (1) A catalog of the fishes of Washington and Oregon (more than 347 in number), with distributional records (pp. 365–380, 63–78, 127–142, 211–213); (2) a list of species whose occurrence in Washington and Oregon is doubtful (pp. 214, 215); (3) a bibliography (pp. 215–223); (4) an index to scientific names of fishes (pp. 223–226, 275–284); (5) an index to common names of fishes (pp. 284–287); and (6) an index to geographical locations (pp. 287–290).

Care and diseases of trout, H. S. DAVIS (*U. S. Dept. Com., Bur. Fisheries, Invest. Rpt., No. 35 (1937), pp. II+76, figs. 15*).—The external and internal animal parasites of trout and bacterial and miscellaneous diseases, including those of uncertain origin, are dealt with in this contribution, accompanied by a bibliography of 58 titles.

[Work in economic zoology and entomology by the New Jersey Stations] (*New Jersey Stas. Rpt. 1937, pp. 33–35, 40–42, 52–58*).—Work of the year (E. S. R., 77, p. 506) with oysters reported includes the eradication of oyster drills (E. S. R., 77, p. 507; 78, p. 214), wintering over of Cape May shore seed, and the effects on water pumpage of spermatic hormones of the oyster. Entomological work includes that with blueberry insects (the blueberry maggot (E. S. R., 77, p. 371), the cherry fruitworm, the cranberry fruitworm, and the cranberry weevil) and cranberry insects (commercial control of the blunt-nosed leafhopper *Euscelis striatulus* Fall. (E. S. R., 78, pp. 510, 822), biological test-

ing of pyrethrum dusts with *E. striatulus*, and investigations of *Sparganothis sulfureana* (*Clem.*)); mosquito investigations and control (E. S. R., 78, p. 826); investigations of the electrostatic field in relation to insect control; insecticides and adhesives for orchard insects (the codling moth, the apple aphid, red mite, and scale insects) (E. S. R., 77, p. 367; 78, p. 74); other insecticides (properties of derris and related organic insecticides, new insecticides involving organic and inorganic chemicals, a study of new wetting agents to be used instead of soap in various insecticides (E. S. R., 77, p. 810) and of a dormant spray to replace the present delayed dormant, and an adhesive arsenical dust for airplane use against cankerworms); vegetable insects (the corn earworm, European corn borer, onion thrips, cabbage maggot, potato aphid, six-spotted leafhopper, and carrot weevil); soil-infesting insects; bees (E. S. R., 77, p. 825); and control of red spider and the orchid weevil.

[Contributions on economic insects, insecticides, and insect control] (*U. S. Dept. Agr., Bur. Ent. and Plant Quar., 1937, E-418, pp. 32; 1938, E-419, pp. 8, pls. 10; E-421, pp. 7, pls. 3; E-423, pp. 5; E-426, pp. 24; E-427, pp. 7, pls. 2*).—The following contributions are in continuation of this series (E. S. R., 78, p. 217): Effect of Acid Lead Arsenate on Different Plants When Applied to Soil About Their Roots for Destruction of Larvae of the Japanese Beetle, by W. E. Fleming (E-418); Practical Methods for Insuring the Production of Insect-Free Flour, by R. T. Cotton and G. B. Wagner (E-419); Protection of Dahlias From Infestation by the European Corn Borer, by C. H. Batchelder and D. D. Questel (E-421); The Tomato Fruitworm [Corn Earworm], by J. Wilcox and M. W. Stone (E-423); A List of Proprietary Detergents, Wetting Agents, and Emulsifying Agents, by H. L. Cupples (E-426); and New Recommendations for the Installation of Package Bees, Using a Spray and Direct-Release Method, by C. L. Farrar (E-427).

[Work in entomology by the Arkansas Station] (*Arkansas Sta. Bul. 351 (1938), pp. 42-46*).—The work of the year reported upon (E. S. R., 76, p. 655) relates to the strawberry crown borer and the sugarcane beetle, both by W. J. Baerg; grasshopper (the differential grasshopper, the lesser migratory grasshopper *Melanoplus mexicanus*, and the red-legged grasshopper) investigations and the flatheaded apple tree borer, both by D. Isely; and mosquitoes of southeastern Arkansas, by W. R. Horsfall (E. S. R., 78, p. 372).

Connecticut State entomologist, thirty-seventh report, 1937, W. E. Britton (*Connecticut [New Haven] Sta. Bul. 408 (1938), pp. 133-266+XI-XVI, figs. 23*).—An account of entomological features of 1937 (pp. 137-152), including an insect record for the year, systematically arranged, and a brief reference to and program of the annual conference of the Connecticut entomologists held in October (E. S. R., 77, p. 813), are followed by reports of regulatory work, including the inspection of nurseries, by Britton and M. P. Zappe (pp. 154-163), and of apiaries, by Britton (pp. 164-170), control of the gypsy moth, by Britton, J. T. Ashworth, and O. B. Cooke (pp. 171-179), the European corn borer, by Britton, N. Turner, and Zappe (pp. 180-184), and Japanese beetle work, by J. P. Johnson and P. Garman (pp. 185-191).

Accounts are given of the armyworm in Connecticut, by Britton (pp. 191-200); tests of apple sprays, by Zappe and E. M. Stoddard (pp. 200-205); dormant sprays for control of the pine needle scale, by Zappe (pp. 205-207); case studies in termite control, by Turner and Zappe (pp. 208-217); control of onion thrips, by Turner (pp. 218, 219); European red mite control investigations (pp. 219, 220), plum curculio control on peaches (p. 221), oriental fruit moth parasite work (pp. 222-227), and experiments with spray controls for the oriental fruit moth (pp. 227, 228), all by Garman; observations on *Tricho-*

gramma in Connecticut peach orchards, by G. R. Smith and Garman (pp. 228–230); further studies on apple maggot control, by Garman and J. F. Townsend (pp. 230–232) (E. S. R., 77, p. 813); results of 2 years' field experiments with stickers for dry lime-sulfur-lead arsenate spray mixtures, by Garman and C. E. Shepard (pp. 232–234); check list of elm insects, by B. J. Kaston (pp. 235–242); control of the squash bug, by R. L. Beard (pp. 243–248); the periodical cicada in Connecticut in 1937, by J. A. Manter (pp. 248, 249); and present status of mosquito control work in Connecticut, 1937, by R. C. Botsford (pp. 250–252).

The report concludes with miscellaneous insect notes dealing with the prevalence of the potato leafhopper, raspberry plants damaged by *Phyllophaga tristis* F., cankerworms in 1937 (the spring cankerworm and the fall cankerworm), damage to a house by the furniture beetle *Anobium punctatum* DeG., records of ticks in the station collection, plant bugs (probably *Lygus quercalbae*) on peaches, lawns damaged by *Ochrosidia villosa* Burm., damage by wireworms, the eastern tent caterpillar, hornworms (the tobacco worm and the tomato worm) on tobacco, a new species of mealybug (*Pseudococcus cuspidatae* Ran) in Connecticut, the peach borer in nursery stock, young chestnut trees damaged by June beetles (*Phyllophaga fusca* Frolich), *Nacerda melanura* L. in a store, dahlias damaged by the spotted cucumber beetle, plum petals devoured by *Hoplia trifasciata* Say, strawberry plants damaged by *Paria* (*Typophorus*) *canella* F., the rose chafer, a wood-boring wasp (*Solenius* sp.), *Typhaea fumata* L. as a nuisance in a dairy, damage to ears of corn by the corn rootworm, small brown beetles (*Coninomus nodifer* Westw. and *C. constrictus* Gyll.) as a nuisance in New Canaan homes, infestations of the house cricket, the melon worm in Connecticut, and lawns damaged by an andrenid bee (*Andrena asteris* Robt.).

[Report of work in entomology by the New Haven Station] (*Connecticut [New Haven] Sta. Bul. 409 (1938), pp. 291–301, 304, 305, 318*).—The work of the year reported upon (E. S. R., 77, p. 657) relates to the elimination of mosquitoes; control of carpenter ants in telephone poles (E. S. R., 78, p. 671); termite control (E. S. R., 78, p. 819); control of the Japanese beetle; dormant sprays for the control of pine leaf scale; the oriental fruit moth; European pine shoot moth; control of the white apple leafhopper and predators of the European red mite (see below); European corn borer (E. S. R., 77, p. 665); control of squash bug; onion thrips; substitutes for lead arsenate in orchard sprays; control of the potato flea beetle; and, at the Tobacco Substation, control of the potato flea beetle on tobacco, the tobacco thrips, and wireworms.

Control of the European red mite and white apple leafhopper, P. GARMAN. (Conn. [New Haven] Expt. Sta.). (*Mass. Fruit Growers' Assoc. Rpt., 42 (1936), pp. 144–157*).—A practical contribution.

[Report of insect control work in Maine, 1933–36] (*Maine Forest Commr. Bien. Rpts., 20 (1933–34), pp. 59–86; 21 (1935–36), pp. 63–84, figs. 3*).—These reports (E. S. R., 69, p. 685) deal with the occurrence and progress of control work with economic insects in Maine, particularly those affecting forests and shade trees.

[Work in entomology by the Maryland Station], E. N. CORY (*Maryland Sta. Rpt. 1937, pp. XXXI–XXXIV*).—A brief reference is made to work under way during the year (E. S. R., 77, p. 664), including a statistical tabulation of the most common insect pests encountered in the several branches of science on which the station gives control information from year to year.

Division of entomology and plant industry, J. J. BARRY (*R. I. Dept. Agr. and Conserv. Ann. Rpt., 2 (1936), pp. 45–90, figs. 26*).—The report deals in large part with control work, particularly with the Japanese beetle, the elm leaf beetle,

the gypsy moth, and the mosquito. The results of apiary inspection are reported.

[Work in economic entomology and zoology by the South Carolina Station]. (Partly coop. U. S. D. A.). (*South Carolina Sta. Rpt. 1937, pp. 52–60, 95–102, 112–117, figs. 5*).—Work of the year reported upon (E. S. R., 77, p. 67) includes that with the rice weevil in corn, by O. L. Cartwright; thrips (especially the tobacco thrips) on seedling cotton and the squash bug, both by J. G. Watts; the southern cornstalk borer and the oriental fruit moth, both by Cartwright; the Mexican bean beetle, by F. Sherman and J. N. Todd; tomato fruitworm and a faunal survey, both by Sherman; bollweevil and miscellaneous cotton insect investigations, including field-plat poison tests, other experiments in bollweevil control, and tests in the control of cotton root aphids (especially the corn root aphid, *Trifidaphis phaseoli* (Pass.), and *Rhopalosiphum* sp.), by F. F. Bondy and C. F. Rainwater; and experiments in control of the tobacco flea beetle during 1937, by N. Allen, J. W. Humphreys, and D. W. Hookom.

[Insects and related species in Tennessee], C. E. Allred, S. W. Atkins, and S. R. Neskaug (*Tenn. Agr. Col., Agr. Econ. and Rural Sociol. Dept. Monog. 57 (1937), pp. 176–179*).—This brief account deals with beneficial insects, economic losses from insects, the principal injurious insects, expenditures for insect control, and the introduction of insect pests.

[Work in economic entomology by the Washington Station] (*Washington Sta. Bul. 354 (1937), pp. 33–36, 72, 73*).—The work of the year briefly referred to (E. S. R., 77, p. 361) includes factors influencing the selection of mineral oil sprays for insecticides, and the possibilities of replacing lead arsenate in codling moth control and control of other injurious apple pests by insecticides nonpoisonous to man, both by R. L. Webster and J. Marshall; the control of five species of orchard spider mites affecting fruit trees in irrigated regions of eastern Washington, by Marshall; life history and control of the carrot rust fly in western Washington, by A. J. Hanson and Webster; the influence of plantings of alfalfa on the abundance of the pea aphid in eastern Washington and control of the tomato fruitworm (corn earworm) in tomatoes grown for canning and in sweet corn, both by Webster and R. D. Eichmann; and onion thrips injury to carnation blossoms in commercial greenhouses, by Eichmann. Work at the Cranberry-Blueberry Substation, by D. J. Crowley, included scale control with insecticides, fireworm control, and fruitworm observations.

Third catalog of the insects which attack plants in Brazil, A. M. da Costa Lima (*Terceiro catalogo dos insectos que vivem nas plantas do Brasil. Rio de Janeiro: Min. Agr., 1936, pp. 460+IV*).—This third edition (E. S. R., 59, p. 552) lists more than 1,749 forms occurring within Brazil. Reference is made to their recorded occurrence as found in some 1,391 contributions from Brazil given in the accompanying bibliography. An index to (1) the genera and species of insects and (2) the host plants is included.

Mechanographic method of recording insect cardiac activity, with reference to effect of nicotine on isolated heart preparations of *Periplaneta americana*, J. F. Yeager. (U. S. D. A.). (*Jour. Agr. Res. [U. S.], 56 (1938), No. 4, pp. 267–276, figs. 7*).—Description is given of an improved photographic method of obtaining records (mechanocardiograms) of the insect heartbeat in isolated preparation. Such mechanograms are of sufficient size and clarity to be submitted to analysis and to show the changes in mechanical activity of the heart mechanism when the latter is submitted to experimental stimulation or to the action of various substances. Both heart rate and heart amplitude can be recorded and measured. Preliminary experiments were made with the heart (isolated preparation) of the American cockroach. The detailed form

of the cockroach mechanocardiogram varies somewhat with the site of attachment of lever to heart, but in general, with a relatively low rate of beat, displays systolic, diastolic, and diastatic periods in the cardiac cycle. As the heart rate increases, the diastatic period decreases, and may even disappear. Often the systolic rise of the curve is preceded by a marked, sudden fall, for which the name "presystolic notch" has been suggested. The significance of the presystolic notch is not yet known, but suggestion is made that it can result from increase of pressure of the fluid within the cardiac tube. It is found that nicotine, which was previously shown to have marked effects on the cockroach heart rate, can have also marked effects on amplitude with no, or with little, simultaneous effect on the rate. Records indicate that nicotine can decrease the degree of cardiac relaxation and can bring the heart to systolic standstill.

Mushroom pests and their control, A. C. Davis (*U. S. Dept. Agr. Circ. 457 (1938), pp. 22, figs. 8*).—A summary of information on the principal pests attacking mushrooms in commercial plantings in the United States and means for their control. Those considered of most importance are the mushroom flies *Sciara coprophila* Lint., *S. multiseta* Felt, *S. agraria* Felt, and *S. pauciseta* Felt (Sciaridae); the manure flies *Megaselia albidihalteris* Felt, *M. agarici* Lint., and *M. iroquoiana* Malloch (Phoridae); the gall gnat *Mycophila fungicola* Felt (Cecidomyiidae); the mushroom mite, *Tyroglyphus longior* Gerv.; the long-legged mite *Linopodes antennaepes* Banks; the bulb mite *Rhizoglyphus phylloxerae* Riley; the mite *Histiostoma* sp.: and a number of species of springtails, of which *Lepidocyrtus* spp. and *Achorutes armatus* Nic. are perhaps the most important.

Report on the insect investigations for the 1937 season, A. W. Morrill, Jr., and D. S. Lacroix. (Coop. U. S. D. A.). (*Connecticut [New Haven] Sta. Bul. 410 (1938), pp. 444–449, figs. 2*).—In reporting further upon investigations of insect pests of tobacco in the Connecticut River Valley (E. S. R., 77, p. 361), reference is made to control experiments with the potato flea beetle on tobacco, the source of flea beetles in tobacco fields, observations on the attractiveness of the tobacco plant to flea beetles, experiments for the control of the tobacco thrips, wireworm (principally *Limonius agonus* (Say)) studies, and losses sustained in sun-grown tobacco, together with notes on the abundance of insects.

Oil baits for grasshopper and armyworm control, M. D. Farrar, W. P. Flint, and J. H. Bigger (*Illinois Sta. Bul. 442 (1938), pp. 413–420*).—The results obtained by Parker, Shotwell, and Morton in the use of oil baits in the Dakotas (E. S. R., 71, p. 70) led to experiments in cooperation with the Illinois State Natural History Survey from 1934 to 1937, inclusive. The findings as relate to armyworm and to grasshopper control are presented in three tables, the first relating to injury to soybean foliage from wet bait and from oil bait, the second a comparison of molasses and oil in bran baits in western Illinois in 1934 and 1935, and the third summarizing the results of experiments with oil baits used against mixed populations of grasshoppers in 1935, 1936, and 1937.

In control tests in 1934 and 1935 baits containing lubricating oils were as effective in controlling both grasshoppers and armyworms as were baits containing molasses and water or water alone. Their general use was recommended to Illinois farmers in 1936, in which year 100 tons were used and in 1937 3,088 tons. The oil bait found most effective consisted of bran or bran and ground corncobs in equal parts 100 lb., poison (white arsenic, etc.) 4 lb., and lubricating oil (S. A. E. 20–30) 2 gal. Advantages resulting from the use of oil baits for grasshoppers are: Satisfactory control, universal availability and satisfactory storage of the materials and of the prepared bait over long periods, and freedom when properly applied from injury to tender crops. It is pointed

out that the cost per pound is slightly higher, and care must be taken lest a defective oil be used.

The bran-oil baits were used successfully for control of armyworms, the relative efficiency being higher when applied in 1934 for the protection of alfalfa against the yellow-striped armyworm and the fall armyworm (77.1 to 83.4 percent) than in 1935 for the protection of corn, rye, and wheat from the armyworm (62.3 to 65.0 percent). Although present in smaller numbers, other species, including the corn earworm, the alfalfa caterpillar, the alfalfa looper, and the garden webworm, were killed by the bait.

The toxicity of phenothiazine and some of its oxidation products in experiments with Carassius auratus, W. A. Gersdorff and H. V. Claborn. (U. S. D. A.). (*Jour. Agr. Res.* [*U. S.*], *56* (*1938*), *No. 4, pp. 277–282, figs. 2*).—A study made of the toxicity with respect to concentration and survival time at 27° C. of phenothiazine, phenothiazine sulfoxide, phenothiazone, and thionol, in which results were compared with rotenone, is reported upon, with goldfishes weighing approximately from 5 to 7 g as the test animals.

Phenothiazone dissolved completely, the other sulfur compounds but slightly, in water at the concentrations required. The most toxic of the sulfur compounds under the conditions of the comparison was phenothiazone. According to the minimum product of concentration and survival time phenothiazone was one-tenth as toxic as rotenone, but was itself 10 times as toxic as phenothiazine. Phenothiazine sulfoxide and thionol were not appreciably toxic to goldfish of this size. Test suspensions of phenothiazine sulfoxide acquired appreciable toxicity when exposed to the air for several days and took on a reddish color similar to that of solutions of phenothiazone. Test suspensions of phenothiazine went through a similar change but to a less degree. It is considered probable that the toxicity of phenothiazine to goldfish may be due to oxidation, after absorption through the gills, to a more toxic compound, which may be phenothiazone, in which case the toxic effect is small because of the insolubility of phenothiazine.

A portable instrument for the analysis of hydrocyanic acid gas-air mixtures, R. J. Wilmot (Fla. Expt. Sta.) and T. N. Gautier (Univ. Fla.) (*Jour. Agr. Res.* [*U. S.*], *56* (*1938*), *No. 4, pp. 283–290, figs. 6*).—The construction and operation of an instrument for the analysis of hydrocyanic acid gas-air mixtures is described in detail. In this operation the gas mixture is pumped from the space containing gas by means of a small motor-driven pump contained in the instrument and passed over a hot platinum filament. The change in resistance of the filament is then measured by means of a bridge, and translated into percentage of hydrocyanic acid gas by volume; its accuracy is ±0.02 percent hydrocyanic acid gas by volume.

Nearctic Collembola, or springtails, of the family Isotomidae, J. W. Folsom (*U. S. Natl. Mus. Bul. 168* (*1937*), *pp. III+144, pls. 39*).—Following a brief introductory account, the springtail family Isotomidae is dealt with, keys being given to the genera, subgenera, and species. Many forms are described as new to science. A nine-page list of references is included.

Mayflies of Puerto Rico, J. R. Traver (*Jour. Agr. Univ. Puerto Rico* [*Col. Sta.*], *22* (*1938*), *No. 1, pp. 5–42, pls. 3*).—This contribution presents descriptions and records of occurrence of 20 species of Mayflies, representing 6 genera in 3 subfamilies, that have been found to occur in Puerto Rico, of which 3 genera are erected and 9 species described as new. Keys to the adults and/or nymphs of the antillean genera of Leptophlebiinae and to the species are included.

An ecological survey of the fresh water insects of Puerto Rico.—I, The Odonata: With new life-histories, J. García-Díaz (*Jour. Agr. Univ. Puerto*

Rico [*Col. Sta.*], *22* (*1938*), *No. 1, pp. 43–97, pls. 4, figs. 4*).—This contribution on the Odonata of Puerto Rico includes tables giving (1) measurements of cast skins of two species, (2) the altitudinal distribution of the adults and nymphs, (3) birds feeding on Odonata as shown by stomach contents, and (4) the seasonal distribution of Odonata, together with a physiographic map of the island with the localities where various species of Anisoptera and Zygoptera have been collected and a bibliography of 44 titles.

The walking stick as a forest defoliator, S. A. GRAHAM (*Mich. Univ., School Forestry and Conserv. Circ. 3* (*1937*), *pp. 28, figs. 6*).—Report is made of observations of the walkingstick, outbreaks of which are becoming common in the black oak forests of the north-central part of the Lower Peninsula of Michigan and promise to continue spreading until practically all suitable stands will ultimately be infested.

The humidity reactions of the African migratory locust Locusta migratoria migratorioides R. & F., gregarious phase, J. S. KENNEDY (*Jour. Expt. Biol., 14* (*1937*), *No. 2, pp. 187–197, figs. 4*).—The author finds that under the conditions of the experiments described *L. migratoria migratorioides* shows a preference for dry air in all parts of the humidity range, although dry air is by no means optimal for development, maturation, and breeding. The strength of the reaction is correlated with the magnitude of the humidity difference available but appears to be little dependent on the region of the humidity range. The mechanism of the reaction is hygrokinetic and possibly hygrophobotactic as well, but probably not hygrotropotactic.

The spruce gall aphid Adelges abietis Linnaeus in southern Michigan, B. H. WILFORD (*Mich. Univ., School Forestry and Conserv. Circ. 2* (*1937*), *pp. 35, figs. 8*).—This is a report of a study undertaken to determine the economic status of *A. abietis* in Michigan and the Northeast, to furnish hitherto unknown or uncertain information on its biology, to ascertain the causes of population fluctuations, to explain the reasons for the individual resistance of certain trees, and to suggest control measures.

Transmission of sugarcane mosaic by the green bug (Toxoptera graminum Rond.), J. W. INGRAM and E. M. SUMMERS. (U. S. D. A.). (*Jour. Agr. Res.* [*U. S.*], *56* (*1938*), *No. 7, pp. 537–540*).—Although Brandes reported in 1920 experiments showing that sugarcane mosaic was transmitted by the corn leaf aphid (E. S. R., 43, p. 547), this remained the only proved vector until 1936, when the authors (E. S. R., 75, p. 811) reported a series of successful transfers with the rusty plum aphid and stated that the green bug had been observed to transfer mosaic in two cases. In a series of experiments conducted in 1936, of which a brief account has been noted (E. S. R., 78, p. 817), 30 green bugs from infected sugarcane plants were transferred to each of 172 healthy plants, and 21 of these developed mosaic. In a parallel experiment 40 of 124 healthy plants exposed to the viruliferous corn leaf aphid developed mosaic symptoms. One transfer of the mosaic resulted from the green bug from infected crabgrass being colonized on healthy sugarcane. These aphids feed upon various parts of sugarcane plants that are above ground and on a number of other grasses commonly found in and around sugarcane fields. The data indicate that the green bug is not, in general, so important in field transfer of sugarcane mosaic as either of the other two vectors, but that it may be the most important transfer agent in certain fields.

Biological studies of Maine moths by light trap methods, C. O. DIRKS (*Maine Sta. Bul. 389* (*1937*), *pp. 33–162, figs. 23*).—Life history data concerning numerous species of macrolepidoptera that have been obtained by means of light traps operated at Orono throughout a 4-yr. period, from 1931 to 1934, are

reported upon. In this study the light traps were used 3 or 4 nights weekly from May to October during each year. A total of 56,131 individual specimens representing 349 species were captured and examined during the 4-yr. period. The number of generations per season and the time of adult activity have been definitely established for over 100 species of Lepidoptera at Orono. Of the total number of moths captured during the study, 22.5 percent were females, the percentage varying as much as 10 percent for different seasons. Among a few species the females occurred in greater numbers than the males. Eighty-two percent of all the females were gravid, a somewhat higher percentage of gravid females than has been reported by other investigators. Few or no moths were taken during nights with an average temperature of 40° to 42° F., but frequently hundreds of specimens were obtained during nights with temperatures of 58° or above, provided other conditions were favorable. Warm, cloudy nights often accompanied by rain and with little or no wind were most favorable for capturing moths. A mercury vapor "Sunlamp" that transmits a portion of its light rays in the violet and ultraviolet range was found to be superior to two other lamps of greater luminosity, which developed no ultraviolet.

The results of the study, based upon identifications of the moths collected, are presented in 13 tables and 22 graphs. A 5-page list of references to the literature cited is included.

Silvicultural control of the gypsy moth, C. E. BEHRE, A. C. CLINE, and W. L. BAKER (*Mass. Forest and Park Assoc. [Bul. 157] (1936), pp. 16, figs. 3*).—The authors show how the owner of a forest may eliminate favored food trees in such a way as to serve the double purpose of gypsy moth control and stand improvement.

Silvicultural aids in the control of the gypsy moth in watershed forests, A. C. CLINE (*Jour. New England Water Works Assoc., 51 (1937), No. 3, pp. 235–244, figs. 4*).—It is pointed out and data are presented showing that silvicultural control in the form of such operations as weedings, improvement cuttings, and thinnings may at present supplement and perhaps in time wholly replace the direct or artificial methods of controlling the gypsy moth in watershed forests.

The gypsy and brown-tail moths and their control, A. F. BURGESS and W. L. BAKER (*U. S. Dept. Agr. Circ. 464 (1938), pp. 38, figs. 17*).—This circular which supersedes Farmers' Bulletin 1623 (E. S. R., 64, p. 750), gives a brief review of injury caused by the gypsy and brown-tail moths, methods of control and an account of Federal and State work which has been carried on to curtail their spread and to protect shade and forest trees. The organization of the work in the New England States, New York, New Jersey, and Pennsylvania, as well as in the Dominion of Canada and by the U. S. Department of Agriculture is described.

Ethylene dichloride emulsion for the control of the peach borer, O. I. SNAPP (*U. S. Dept. Agr., Bur. Ent. and Plant Quar., 1938, E-424, pp. 4*).—Attention is drawn to the advantages that ethylene dichloride has over paradichlorobenzene for control of the peach borer, based upon experiments conducted by the author and J. R. Thomson, Jr., in Georgia, and later carried on cooperatively with W. P. Flint and S. C. Chandler (Ill. Expt. Sta. et al.) and P. J. Parrott, D. M. Daniel, and J. E. Dewey (N. Y. State Expt. Sta.).

Ten years' experiments with codling moth bait traps, light traps, and trap bands, J. R. EYER (*New Mexico Sta. Bul. 253 (1937), pp. 67, figs. 25*).—The results of experiments with cane sirup baits and aromatic esters as codling moth attractants, conducted for a period of 10 yr., from 1928 to 1937, inclusive are reported, the details being given in 27 tables and 11 graphs. In general cane sirup bait made of a 1:10 dilution of Brer Rabbit cane sirup in wat

proved to be the most attractive codling moth bait under New Mexico conditions. The addition of sodium benzoate in 0.2-percent concentration was found to increase its attractiveness materially. Chemical studies made to determine the importance of the process of fermentation and the significance of the products formed indicated that "fermenting sirup baits are most attractive during their period of maximum alcohol and gas formation. The formation of acetic acid is also closely associated with attractiveness. . . . Tests of almost 100 esters obtained commercially through synthesis from cane sugar, vinegar, acetic acid, and related products revealed 2 which are particularly attractive to the codling moth—ethyl oxyhydrate and isobutyl phenyl acetate."

As to sex attractiveness, the carbohydrate types of bait were found to attract the moths in the ratio of approximately 45 females to 55 males and the aromatic esters in the ratio of 65 males to 35 females.

"Of the various light sources tested, the mercury vapor types producing 300 to 700 lumens in the visible region within wavelengths of 3,000 to 7,000 A. U., that is, largely blue, violet, and ultraviolet in quality, proved most attractive. Electrified grids or suction fan retrieving devices were about equally effective as attachments for capturing moths attracted to baits or lights. The effect of bait and light traps separately and in combination on the infestation of fruit [was] observed and compared with the control obtained by standard schedules of arsenical sprays. Although the fruit in baited and illuminated trees was often less wormy than that in neighboring unsprayed trees, the benefit was not so great as that obtained by spraying, or sufficiently pronounced to warrant at present the recommendation of bait or light trapping as a substitute for spraying. The work thus far, however, suggests that improvements and refinements both in the attrahents and traps may increase the effectiveness of such appliances sufficiently to make them practical."

Of the various weather factors observed to affect bait and light trap catches, temperature and relative humidity were the only ones from which significant correlations were obtained, and these applied only when the range of the weather factor fluctuated both above and below the optimum for moth flight. "Protracted rains and perhaps barometric pressure and wind velocity may be significant, but their association with large or small variations in catches was so sporadic that as yet no conclusions or generalizations can be drawn. . . .

"Experiments with chemically treated bands and certain soil fumigants indicated that both methods will effectively destroy large numbers of overwintering larvae without injury to apple trees. The former practice is strongly recommended to all orchardists."

Chemically treated bands for codling moth control, A. M. Woodside (*Virginia Sta. Bul. 315 (1938), pp. 22, figs. 5*).—Experiments conducted over a period of 3 yr., commencing in 1933, and reported upon in 10 tables, relate particularly to orchard tests of hot-dipped and cold-dipped bands in 1934; the weight of chemical coating deposited on 2-in. corrugated bands dipped to three-fourths of their width, turned over and dipped again, in 1937; orchard tests of bands in 1935, 1936, and 1937; loss of chemical coating from bands while on the trees in 1935, 1936, and 1937; and the number of worms captured in experimental bands and cost of banding apple trees in 1934–37, all at Staunton. Discussions of materials and methods and directions for banding are also given.

It is concluded that properly treated bands on well scraped trees will capture and prevent the further development of from 60 to 70 percent of the worms which leave the fruit. Such capture will reduce second-brood infestation to some extent and should reduce the winter carry-over of codling moth larvae by 40 percent. Since the purpose of the chemical treatment of bands is to

prevent the larvae from completing their development to moths, a band should have sufficient chemical coating to kill the larvae which enter before August 15, after which time in Virginia they do not change to moths until the following spring and consequently may be destroyed when the bands are removed. A coating of 10 oz. per 25 linear feet of 2-in. band has been found to be satisfactory.

"The average cost of banding apple trees is about 5 ct. each, exclusive of the cost of scraping the trees. The cost of scraping is somewhat higher, but trees in orchards moderately or heavily infested with codling moth should be scraped whether bands are used or not. Bands are recommended as a supplement to, not as a substitute for, spraying. Their control value justifies their use in all heavily infested orchards and around the packing sheds in moderately infested orchards. They are a practical supplement to spraying on any trees where they will capture 30 to 40 worms per tree. Bands may be purchased for about $2.50 per 250-ft. roll and may be made at home at a somewhat lower cost, but it is inadvisable for a grower to attempt to make his own bands unless he can use at least 4,500 ft. On account of the greater uniformity of the factory-mixed dipping preparations, any grower who makes his own bands should use one of these preparations."

Results with beta naphthol bands in 1937, A. M. Woodside. (Va. Expt. Sta.). (*Va. Fruit, 26 (1938), No. 3, pp. 10, 12, 14, 16*).—The results of experiments in preparing and testing chemically treated bands as an aid in reducing codling moth injury at Staunton in 1937 are presented, the details being given in table form. The orchard tests were similar to those obtained in previous years (E. S. R., 77, p. 664), except that a smaller percentage of worms were able to complete their development to moths and escape from the bands. "All bands which had a coating of 0.3 oz. or more per foot, and some which had even lighter coatings, were satisfactory. This seems to have been the result of some unusual seasonal condition, and does not indicate that the more lightly coated bands should be recommended, as they would be unsatisfactory in many seasons."

Bait traps for the control of the oriental peach moth, M. L. Bobb (*Virginia Sta. Bul. 314 (1938), pp. 14, figs. 2*).—The results obtained from the use of baits and bait traps for the control of the oriental peach moth in peach orchards in Albemarle County during the seasons of 1935, 1936, and 1937 are reported. "The moths were captured in largest numbers in traps using a bait solution consisting of 1 part of lignin pitch to 20 parts of water to which 1 cc of terpinyl acetate per quart was added. Sodium benzoate used to check the fermentation of the bait increased to a slight extent the catch of moths in sirup solutions during the hot summer months. Such an inhibitor was not necessary with the lignin pitch solution. The addition of yeast to sirup solutions in the spring to increase the rate of fermentation was not necessary. Quart glass fruit jars and quart tin cans were more satisfactory for bait traps than gallon containers, shallow pans, or cones. Bait containers suspended from standards in the open centers of peach trees with dense foliage caught more moths than containers suspended from limbs of the trees. Traps when filled with the bait solution caught more moths than when partly filled. Quarter-inch-mesh-wire screens over the tops of the traps decreased the catch of moths approximately 65 percent. When bait traps were suspended at several different heights in peach trees, the traps in the tops of the trees captured 75.9 percent of all the moths caught. The largest catch of moths was made in unpainted pails. Of the painted pails, the yellow pails gave the largest catch and black the smallest. Bright yellow and aluminum paints were the most satsfactory for protecting

bait traps and for attracting oriental peach moths." It is pointed out that the traps in Virginia should be suspended in peach orchards about April 25 in order to catch the moths emerging from the hibernating larvae.

Insecticides to control the European corn borer on sweet corn, B. B. PEPPER (*New Jersey Stas. Circ. 377 (1938), pp. 4*).—A practical account of insecticides and their use in controlling the European corn borer on sweet corn.

Toxicity tests with synthetic organic compounds against culicine mosquito larvae, D. E. FINK, L. E. SMITH, D. L. VIVIAN, and H. V. CLABORN (*U. S. Dept. Agr., Bur. Ent. and Plant Quar., 1938, E–425, pp. 34*).—An investigation conducted in continuation of work with synthetic organic compounds by Campbell et al. (E. S. R., 72, p. 503), in which mosquito larvae were used as test insects, is reported. The northern house mosquito, *Culex nigripalpus* Theob., *C. salinarius* Coq., and the southern house mosquito were found equally susceptible to organic compounds, although the southern house mosquito was used chiefly in the studies reported. Of the 400 synthetic organic compounds tested, 220 proved effective enough to kill about 50 percent of the test insects in 16 hr. at a concentration of 100 p. p. m. and 23 were adjudged to be at least as toxic as rotenone. The 10 most toxic compounds tested, all of which are considered to be better than rotenone, are phenothiazine, 4-(*p*-bromophenylazo)-resorcinol, 4-(*p*-bromophenylazo)-*o*-cresol, *p*-(*p*-bromophenylazo)-phenol, 4-(2,5-dichlorophenylazo)-*o*-cresol, 4-(*p*-bromophenylazo)-*m*-cresol, phenyl mercaptan, phenothioxin, *p*-tolyl mercaptan, and 6-methylphenothiazine.

Recent additions to our knowledge of "Anopheles maculipennis" races, L. W. HACKETT (*League Nations Health Organ. Bul., 6 (1937), No. 1, pp. 1–16*).—A consideration of this subject, presented with a list of 31 references to the literature, shows that the basis of the division of the *A. maculipennis* complex into varieties or races still remains the egg, "whose pattern and floats permit the setting up of eight or nine distinct forms, of which at least six are well established by biometric, genetic, and physiological tests, as well as by field studies on their bionomic characters. A list is suggested of essential points to be observed before reporting new local varieties. The systematic position of the races is still vague, although malariologists have not waited on the entomologists before putting race sanitation into practice. The relationship of the different forms to malaria has been further clarified, especially as regards the distinction to be drawn between the fresh- and salt-water breeders, although much mystery still surrounds the ecology and epidemiological role of [*A.*] *atroparvus*. In the meantime many other widespread species of anophelines have been found to be complexes similar to the [*A.*] *maculipennis* group, thus suggesting the solution to a number of baffling epidemiological problems in malaria."

New Jersey Mosquito Extermination Association, twenty-fourth annual meeting (*N. J. Mosquito Extermin. Assoc. Proc., 24 (1937), pp. 236+[3], pls. 8, figs. 19*).—The contributions presented at the meeting of the association held at Atlantic City in March 1937 (E. S. R., 78, p. 79) include the following: Principles Underlying the Protection of Outdoor Meetings From the Mosquito Pest and Methods of Application, by J. M. Ginsburg (pp. 5–11) (N. J. Expt. Stas.) (E. S. R., 78, p. 826); Methods of Applying the Larvicide as a Repellent, by R. L. Vannote (pp. 11–13); Maintenance of a Supply of Mosquitoes for Experimental Work During the Dormant Season, by P. Granett and G. E. Powers (pp. 15–20); Muskrat Culture and Its Economic Significance in New Jersey, by E. S. Harris (pp. 20–24); The Relation of Mosquito Trap Catches to Human Comfort, by R. J. VanDerwerker (pp. 25–29); A Summary of Mosquito Work in New Jersey in 1936, by T. D. Mulhern (pp. [illegible]

of Work on Mosquitoes Throughout the World in 1936, by F. C. Bishopp and C. N. Smith (pp. 69–96); *Mosquito Suppression Work in Canada in 1936*, by A. Gibson (pp. 96–108); Experiences in Mosquito Control in Connecticut, by R. C. Botsford (pp. 109–111) (Conn. [New Haven] Sta.); New and Significant Experiences in Mosquito Control in the DesPlaines Valley Mosquito Abatement District, by J. L. Clarke (pp. 112–126); New and Significant Experiences in Mosquito Control in Greater New York, by R. Gies (pp. 128–131); Some Special Types of Publicity Useful in Mosquito-Control Work, by R. H. Sammis (pp. 131–134); Education in Mosquito Control Work, by B. M. Mitchell (pp. 134–136); *New and Significant Developments During 1936 in the Delaware* Mosquito Control Work, by W. S. Corkran (pp. 136–141); Equipment for Removing Channel Obstructions, by R. E. Dorer (pp. 141, 142); New and Significant Experiences in Mosquito Control in Delaware County, Pennsylvania, by H. W. Banks (pp. 143–147); The Problem of Mosquito Abatement in the Alameda County Mosquito Abatement District and the Results Obtained, by H. F. Gray (pp. 147–151); The Effect of Summer Rainfall on Mosquito Prevalence, by R. J. VanDerwerker (pp. 152–163); *Experiments in Florida in Repelling Mosquitoes by Outdoor Spraying*, by W. V. King, G. H. Bradley, and T. E. McNeel (pp. 163–172); Mosquito Migration Across Delaware Bay, by D. MacCreary and L. A. Stearns (pp. 188–197) (Del. Sta.); The Caterpillar Crane as an Instrument in Mosquito Control, by J. E. Brooks (pp. 197–199); The Problem of Providing Mosquito Control in Areas Subject to Flights of Fresh-Water Swamp Mosquitoes, by R. L. Vannote (pp. 199–201); The Four-County Committee, by A. R. Cullimore (pp. 201–205); Some Relations of Mosquito-*Control Work to Other Conservation Activities: A Problem in Practical Human Ecology*, by R. D. Glasgow (pp. 205–211); *A Preliminary Report on the Relation of Mosquito-Control Ditching to Long Island Salt-Marsh Vegetation*, by N. Taylor (pp. 211–217); The Malaria Hazard in Uninfected Territory, by L. L. Williams, Jr. (pp. 218–220); Some Informal Remarks on the Malaria Hazard, by J. A. LePrince (pp. 220–223); Outletting Inclosed Marshes to the Sea, by W. Austin and O. W. Lafferty (pp. 223–225); Effect of Mosquito Reduction Work on Malaria Prevalence in Pensauken Township and Camden County Areas, by F. C. Metzger (pp. 225–227); and Mosquito Problems, by T. J. Headlee (pp. 228–236) (N. J. Stas.).

The nutrition of flesh fly larvae, Lucilia sericata (Meig.).—II, The development of fat, J. S. Yuill and R. Craig (*Jour. Expt. Zool., 75 (1937), No. 1, pp. 169–178, figs. 4*).—The studies reported in this second contribution (E. S. R., 69, p. 394) have led to the conclusion that not only the type of larval fat of *L. sericata* but also the changes in the composition of the fat during growth are markedly influenced by the type of fat ingested.

The toxicity of Haplophyton cimicidum A. DC. to fruitflies, C. C. Plummer (*U. S. Dept. Agr. Circ. 455 (1938), pp. 11*).—Report is made of a study of the toxicity of *H. cimicidum*, commonly known as la hierba de la cucaracha (cockroach plant) in Mexico, where it has long been used to kill cockroaches, flies, mosquitoes, fleas, lice, and other insects. The demonstration of the effectiveness of extracts of the plant against the Mexican fruitfly led to the studies here reported. Toxicity data were taken under varied conditions of temperature, concentration of spray, molasses content, and age of spray. In the insectary, sprays did not lose their toxicity when held 58 or 59 days either in solution or mixed with molasses and dried on mango foliage. In the laboratory, sprays lost little of their toxicity after being held 190 days in solution without molasses. Sprays mixed with molasses and held dry on glass plates at 30° and 35° C. and 30-percent relative humidity for 310 days retained much of their

toxic property. A spray held in solution for 190 days, and then mixed with molasses and dried on glass plates held at 30° and 35° and 30-percent r. h. for 358 days, remained slightly toxic. An extract held without molasses at room temperature for 527 days was not toxic. Sprays of the lowest molasses content were the most effective. The experiments show that a spray containing 3.3 g of dried leaves of a good sample per 100 cc is toxic to fruitflies. Some samples of the plant are nontoxic or only slightly toxic to the fruitfly. Flies paralyzed after the ingestion of sweetened extracts of the plant rarely recover; therefore paralyzed flies may be considered the same as dead flies in calculating the toxicity of extracts.

A chemical study of the toxic material in the plant led to the belief that it may be an alkaloid, a salt of an alkaloid, or an alkaloid glucoside, although this is not yet definitely proved.

The flat-headed apple-tree borer in fruit and shade trees, R. ROBERTS (*Nebr. State Bd. Agr. Ann. Rpt., 1936, pp. 516–525*).—A discussion of the flat-headed apple tree borer as an enemy of fruit and shade trees in Nebraska and means for its control.

Naupactus leucoloma (Coleoptera: Curculionidae), a new pest to the United States, J. R. WATSON. (Fla. Expt. Sta.). (*Fla. Ent., 20 (1937), No. 1, pp. 1–3, fig. 1*).—A brief account is given of the white fringed beetle *N. leucoloma* Boh., an insect native to Argentina, Chile, and Uruguay and found in New South Wales, Australia. It has now appeared in the United States, having been identified by the station from material accumulated in Okaloosa County, Fla., in July 1936.

In the examination of the infested area made by the author and U. S. Loftin (U. S. D. A.) in May 1937, the grubs of this pest were found causing severe damage, a third of the stand of cotton and fully half of that of corn and a considerable percentage of the stands of velvetbeans and peanuts having been destroyed on one farm. The grubs are not strictly root feeders but feed rather on the portions of the stems underground, gouging out large cavities in these stems, which results in the death of the plants. In addition to the crops mentioned, which are the ones chiefly grown in the infested section, in captivity it has been found to attack beans readily and practically all crops in infested fields and many weeds, especially the so-called Mexican clover (*Richardia*). It is pointed out that the adults commence to appear about June 15 and are without the power of flight. A ditch with perpendicular sides makes an effective barrier and may serve as a control measure.

At the time of writing the beetle had also been found to infest a farm in Walton County, Fla., and in the adjoining portions of Alabama.

Additional notes on Naupactus leucoloma, J. R. WATSON (*Fla. Ent., 20 (1937), No. 2, pp. 22–25*).—These notes, which supplement the above, are based on two trips made to the infested area in July 1937 and observations of the habits of the adult. Attention is drawn to the discovery that only females are produced and the resulting danger of spread through transportation of a flightless female or grub.

The white-fringed beetle Naupactus leucoloma Boh., H. C. YOUNG, B. A. APP, G. D. GREEN, and R. N. DOPSON, JR. (*U. S. Dept. Agr., Bur. Ent. and Plant Quar., 1938, E–420, pp. 13, pl. 1*).—This contribution upon a new weevil recently discovered in Florida, Alabama, Mississippi, and Louisiana supplements those by Watson noted above. It takes up its present known distribution in the United States, its morphology, biological observations, host plants of adults and larvae, effect of topography and soil type on infestations, economic importance, and suppressive measures.

A key to separate the larva of the white-fringed beetle Naupactus leucoloma Boh. from the larvae of closely related species, W. H. ANDERSON (*U. S. Dept. Agr., Bur. Ent. and Plant Quar., 1938, E-422, pp. 2, pl. 1*).—This key for the separation of the larvae of *N. leucoloma* from those of Fuller's rose beetle, *Atripus texanus* Pierce, and *Naupactus* n. sp. is accompanied by a plate illustrating the differential structure.

Suggestions for the control of the pea weevil in Oregon, with especial reference to peas grown for processing, J. C. CHAMBERLIN and K. W. GRAY. (Coop. U. S. D. A.). (*Oregon Sta. Circ. 126* (*1938*), *pp. 23, figs. 17*).—Recommendations and suggestions for the control of pea weevil in freezing and canning peas are given in this contribution.

Flicker and the reactions of bees to flowers, E. WOLF and G. ZERRAHN-WOLF (*Jour. Gen. Physiol., 20* (*1937*), *No. 4, pp. 511–518, figs. 3*).—In the study reported bees were conditioned to collect food on natural and artificial flower beds, parts of which could be set into rotation or side to side movement.

It was found that through the relative motion of the flowers the number of alternating stimuli upon the bee's eye is increased. Due to the fact that bees show a strong reaction to intermittent optical stimulation, the proportion of bees settling on the moving section of the flower bed is also increased. It is considered probable that the visual reaction of bees to flowers in nature is largely due to the flicker effect produced through the motion of the bees relative to the flowers.

Studies on longevity and productivity in Trichogramma evanescens, H. O. LUND. (Minn. Expt. Sta.). (*Jour. Agr. Res.* [*U. S.*], *56* (*1938*), *No. 6, pp. 421–439, figs. 3*).—The author reports upon the effects of feeding, absence of host eggs, mating, superparasitism, diffused light, temperature, and moisture upon the longevity and productivity of the egg parasite *T. evanescens*, reared on the angoumois grain moth. It was found that adult feeding increases both longevity and productivity, the adult females living longer in the presence of host eggs. When host eggs are withheld for 2 or 3 days only, productivity drops while length of life remains the same. Productivity is reduced but longevity is unaffected by pairing. Superparasitism produces female parasites with normal life spans but reduces productivity; males are shorter-lived. Adult longevity varies inversely as the temperature to which the adults are subjected, but directly as the temperature to which their immature stages are exposed. The optimum temperature for productivity is about 25° C. in either case. An abnormally low sex ratio occurs in progeny of parasites reared at 15° (0.42 female as opposed to a normal of 0.66), indicating that partial sterility of the male occurs at this temperature. Adults subjected to high and low humidities exhibit lowered longevity and productivity. Adults whose immature stages were exposed to moisture extremes exhibit a decidedly reduced productivity but an unaffected longevity. A correlation of $+0.639 \pm 0.071$ exists between the longevity of mated females and their productivity.

A list of 30 references to the literature is included.

Effectiveness of imported insect enemies of the satin moth, T. H. JONES, R. T. WEBBER, and P. B. DOWDEN (*U. S. Dept. Agr. Circ. 459* (*1938*), *pp. 24, figs. 4*).—The first part of this contribution on parasite control of the satin moth consists of a report of work by Dowden, commenced in 1926 and continued for several years in Europe, that resulted in the introduction of parasites from 1929 to 1934, inclusive. A report on the satin moth and its enemies (1) in New England, by Jones and Dowden (pp. 5–15), and (2) in the State of Washington, by Webber, largely in 1935 (pp. 16–23), follows.

Of the 7 introduced species of Hymenoptera and Diptera parasitic on the satin moth in Europe that were liberated in satin moth infestations in New England from 1927 to 1934, only 1, *Apanteles solitarius* Ratz., is known to have become established as an effective agent in reducing satin moth infestations in that region. Of the 10 species of insect enemies of European origin liberated in Washington State from 1929 to 1934, 4 are known to have become established, namely, *Compsilura concinnata* Meig., *Meteorus versicolor* Wesm., *Eupteromalus nidulans* Thoms., and *A. solitarius*. *A solitarius* rapidly increased and spread. Dissections of satin moth larvae collected at various points in the State indicate that *M. versicolor* and *C. concinnata* have become of considerable importance as parasites of the satin moth at or near points in which they were liberated. This is of particular interest in connection with *M. versicolor*, since it is not known to have gained a foothold in New England. Observations show that there was a general decrease in satin moth population in Washington in 1935. This decline is coincidental with a conspicuous abundance of *A. solitarius*, and it is considered reasonable to attribute this decline to the additional aid of this introduced species. It is pointed out that native insect enemies have not been of importance in the control of this pest.

Rogas unicolor (Wesm.), a braconid parasite of the satin moth, P. B. DOWDEN. (U. S. D. A.). (*Jour. Agr. Res.* [*U. S.*], *56* (*1938*), *No. 7, pp. 523–535, figs. 4*).—Following a brief introduction to this study, which was conducted in the course of the work above noted, a review of the literature in connection with a list of 12 references, and a discussion of its economic importance and introduction into the United States, technical descriptions are given of its immature stages, including five larval instars, as are accounts of its biology, effect of parasite on the host, hyperparasites, and factors limiting its effectiveness. This braconid parasite of the satin moth, of minor importance in Europe, was collected in 1933 and 1934 at Budapest, Hungary, in about 7,000 cocoons, and sent to the United States, the adults being colonized in the infested area of New England and Washington State. As yet the species has not been definitely recovered. It has a single generation, the winter being passed as a first-instar larva within the hibernating host larva. Fourteen species of hyperparasites were reared from cocoons collected in the field at Budapest.

Evolution in spiders, A. M. CHICKERING (*Mich. Acad. Sci., Arts, and Letters, Ann. Rpt., 38* (*1936*), *pp. 22–51*).—This contribution is presented with a list of 58 references to the literature.

The red spider on apples, H. BAKER (*Nebr. State Bd. Agr. Ann. Rpt., 1936, pp. 570–575*).—A discussion of the common red spider on apples as relates to northeastern Kansas and northwestern Missouri.

The red spider (*Tetranychus telarius* Linn.), R. ROBERTS (*Nebr. State Bd. Agr. Ann. Rpt., 1936, pp. 561–566*).—A practical contribution on the common red spider and means for its control.

ANIMAL PRODUCTION

[Experiments with livestock in Arkansas] (*Arkansas Sta. Bul. 351* (*1938*), *pp. 36–39, 41, 42*).—Investigations for which results are noted include the supplementary value of tankage, cottonseed meal, and tankage-cottonseed meal mixtures to yellow corn for pigs on Sudan grass pasture, ryegrass pasture, and in dry lot, by E. Martin; the relation of dietary silicon to the silicon content of wool, and the intermediary metabolism of glycine in the fowl, both by A. R. Patton; the value of rice byproducts in the laying ration, by R. M. Smith; and crossbreeding chickens for broiler production, by W. R. Horlacher and Smith.

[Livestock investigations in Maryland], B. E. CARMICHAEL (*Maryland Sta. Rpt. 1937, pp. XXV–XXVIII*).—Included are brief progress reports on the production of "old Maryland" hams, fish meal and linseed meal as protein supplements for fattening steers, and the value of damaged rye for fattening hogs.

[Livestock investigations in South Carolina] (*South Carolina Sta. Rpt. 1937, pp. 62, 63, 68–73, 82–85*).—Results are briefly reported on studies dealing with the effect of rations of cottonseed meal and hulls and of corn and alfalfa hay on the quality of beef produced, and cottonseed hulls v. corn stover as roughage for fattening steers, both by E. G. Godbey and L. V. Starkey; creep feeding v. noncreep feeding of beef calves, sorghum silage v. rye pasture and silage for wintering stocker steers, the rate and economy of gains of crossbred v. purebred hogs, and the beef producing capacity of Coastal Plains pastures variously fertilized, all by E. D. Kyzer and T. M. Clyburn; vegetable proteins in the laying and breeding rations, cottonseed meal in chick starting rations, and factors affecting the physical quality of eggs, all by C. L. Morgan and R. C. Ringrose; and calcium balance in the nutrition of the hen, by Morgan, Ringrose, and J. H. Mitchell.

[Livestock investigations in Washington] (*Washington Sta. Bul. 354 (1937), pp. 22, 23, 24, 25, 26, 27, 57–60*).—Results are briefly reported on the following studies: The nutritive value of crested wheatgrass, tall oatgrass, slender wheatgrass, and bromegrass at the anther-falling stage of maturity and of first- and second-year sweetclover hays, both by J. Sotola; a comparison of rations for nursing ewes, by H. P. Singleton and H. Hackedorn; alfalfa meal v. sweetclover meal in rations for bred gilts, by H. G. McDonald; the protein requirements of growing chicks and of laying hens, the vitamin G requirements of poultry, and the utilization of fish byproducts, all by V. Heiman, J. S. Carver, J. L. St. John, and J. W. Cook; the supplementary value of yeast in the laying ration, by Carver; the physiological response of turkeys to mash and pelleted feeds, by Carver and L. A. Wilhelm; factors influencing interior egg quality and the effects of storage conditions on egg quality, both by Wilhelm; and the nature of watery white in eggs, by St. John.

Methods of making silage from grasses and legumes, T. E. WOODWARD and J. B. SHEPHERD (*U. S. Dept. Agr., Tech. Bul. 611 (1938), pp. 34, fig. 1*).—Results of a series of trials in which grass alone, grass-legume mixtures, and alfalfa alone of varying moisture contents were ensiled, both in a chopped and in an uncut condition, without preservatives and with additions of either mineral acids or molasses are reported. It was concluded that the exclusion of air is the only condition required to prevent molding or rotting of silage. The ensiling of uncut material was considered impractical because of the great difficulty of firm packing and exclusion of air. Fine chopping (0.25 in. if possible) is recommended. Fresh green grass alone or mixed with legumes, chopped and firmly packed in the silo with no other treatment, gave a silage of good flavor and odor with low loss of dry matter and carotene. Partial drying before chopping facilitated handling, increased the quantity of dry matter stored, increased the temperature of fermentation, and tended to improve the palatability of the silage. It is recommended, however, that moisture contents of over 50 percent be maintained. Fresh green alfalfa ensiled without preservatives kept without molding or rotting. The odor of the silage was not objectionable when the dry matter was above 30 percent, but when below 30 percent the silage usually developed offensive odors. The addition of dilute acids either to grass or to alfalfa silage lowered the palatability. Additions of molasses tended to improve the palatability but otherwise were not advantageous in samples of medium moisture content. Alfalfa silage fed

alone or with corn silage and grain appeared equal to alfalfa hay (dry-matter basis) for milk production, but inferior to hay for the maintenance of body weight.

Legume and grass silage: A survey of methods and results on 380 Northeastern farms. (Coop. 10 States). (*New Jersey Stas. Bul. 643 (1938), pp. 23, figs. 3; reprinted as New Hampshire Sta. Bul. 305 (1938), pp. 23, figs. 3*).—The returns secured in a questionnaire survey of the use of grass and legume silage in 17 States are summarized with regard to ensiling operations, feeding methods, total costs, labor requirements, and effects on flavor and color of milk. Average green yields of the various crop combinations ranged from about 6 to 9 tons per acre. Molasses, phosphoric acid, the A. I. V. process, and no preservatives were used by 328, 34, 3, and 15 operators, respectively. The amount of molasses applied to various crops ranged all the way from 14 to 250 lb. per ton. Such silage was fed primarily to dairy cattle and in some instances to beef cattle, horses, sheep, swine, and poultry. Seventy-five percent of the operators reported that silage was put up for regular winter feeding, either to replace corn silage, hay, or both. Sixty-eight percent used it to supplement pasture. Only 6 percent reported that they did not plan to put up such silage in the future.

Digestibility of alfalfa, timothy, and soybeans as silages and as hays, J. A. Newlander, H. B. Ellenberger, O. M. Camburn, and C. H. Jones (*Vermont Sta. Bul. 430 (1938), pp. 24*).—The results of a series of digestion trials with dairy cows to determine the coefficients of digestibility of 41 lots of silages and hays made from alfalfa, timothy, and soybeans are summarized. The alfalfa and timothy were cut at two stages of maturity, the silages were prepared both with and without the addition of molasses to freshly cut and slightly wilted material, and the hays were made by natural sun-curing and by artificial drying. Most of the trials included three 5-day collection periods during which the cows received the test roughage as a sole ration at approximately a maintenance level. In general, the hays (dry-matter basis) carried less ether extract and ash and more nitrogen-free extract than the silages, and artificially dried hays contained less crude fiber than silages or naturally cured hays. Digestibility coefficients of hays tended to be slightly higher for nitrogen-free extract but lower for ether extract than the silages. Crude fiber and nitrogen-free extract seemed somewhat more digestible in molasses silages than in those prepared without molasses. The silages were slightly higher in digestible protein than the hays. On the basis of total digestible nutrient content the feeds ranked as follows: Artificially dried hay, molasses silage, untreated silage, and sun-cured hay, the latter two being about equal.

Utilization of molasses, II, III, A. R. Lamb (*Hawaii. Planters' Rec. [Hawaii. Sugar Planters' Sta.], 42 (1938), No. 1, pp. 77–96, figs. 8*).—This series of studies is continued.[2]

II. *Pen-fattening of beef cattle on molasses and other by-product feeds.*—A trial is reported comparing the average rate of gain of high grade feeder steers on good pasture without grain supplement with that of steers in dry lot receiving fresh cane tops and a concentrate mixture of screened bagasse, molasses, pineapple bran, soybean oil meal, steamed bonemeal, and salt. Two combinations of these ingredients were fed (1) 32 : 38 : 12 : 16 : 1 : 1 and (2) 24 : 38 : 20 : 16 : 1 : 1. Over a 96-day fattening period steers on pasture and on the first and second dry-lot rations gained an average of 116, 96, and 110 lb. per head, respectively. Steers finished in dry lot showed more finish, com-

[2] Hawaii. Planters' Rec. [Hawaii. Sugar Planters' Sta.] 40 (1936), No. 2, pp. 121–125.

manded slightly higher market prices, and had a higher average dressing percentage than the grass-fed steers.

III. *Feeding trials on laboratory animals to determine the value of bagasse, molasses, and kiawe bean meal.*—Two feeding trials with rabbits are reported. In the first of these the growth rate of control rabbits on a ration of alfalfa meal, rolled barley, and molasses 2 : 1 : 1 was compared with a similar group on a ration of sifted cane bagasse, molasses, and soybean oil meal 55:26.5: 18.5. The latter group gained more slowly throughout the trial and after 21 months' feeding averaged approximately 2,500 g as compared to 3,700 g for the controls. At this point changing the experimental group to a ration of bagasse, pineapple bran, soybean oil meal, and molasses 2 : 1 : 1 : 2 resulted in greatly accelerated gains. A second trial comparing the growth rate of rabbits receiving kiawe bean meal at 99, 90, and 30 percent levels in the diet indicated that the protein value of this product was inadequate for optimum growth when fed at the higher levels, but that it was a satisfactory constituent in a mixed ration also containing soybean oil meal, molasses, and bagasse.

Feed analysis, W. L. Adams, T. Wright, Jr., and L. Linton (*Rhode Island Sta. Ann. Feed and Fert. Circ., 1937, pp. 4–50*).—The guaranteed and found analyses of 446 samples of stock, dairy, and poultry feeds and 90 samples of dog, cat, and pet feeds, collected for official inspection, together with the essential provisions of the recently amended feed control law of the State, and a list of manufacturers registering brands from January 1 to September 1, 1937, are presented.

Growth and development with special reference to domestic animals, XLV, XLVI (*Missouri Sta. Res. Buls. 281 (1938), pp. 43, figs. 14; 283 (1938), pp. 28, figs. 17*).—Further contributions are made to this series of studies (p. 378).

XLV. *Energy-metabolism levels during gestation, lactation, and post-lactation rest*, S. Brody, J. Riggs, K. Kaufman, and V. Herring.—Experiments with lactating rats showed that milk production and the respiratory quotient of the animals fall and rise together with fasting and refeeding, the respiratory quotient declining from 1 to about 0.73, and milk production declining to practically 0 within 12 hr. after food was withheld. On refeeding after a 48-hr. fast, the respiratory quotient and milk production promptly rose to prefast levels. From this it is inferred that in the rat it is not possible to determine basal metabolism during normal lactation, since normal lactation appears to be incompatible with the postabsorptive state. The resting energy metabolism of rats during gestation was found to be practically the same as during sex rest for animals of the same size. It is suggested that the body weight increase during gestation without an apparent food-energy cost is accounted for by (1) a reduction of spontaneous physical activity, (2) a saving of the heat increment of feeding because protein stored for growth does not yield a heat increment, (3) the watery nature of the gestation gains, and (4) the low maintenance requirement of the pregnant uterus because of the thermoneutrality of its environment and its low tonicity and physical activity.

XLVI. *Relation between heat increment of gestation and birth weight*, S. Brody.—A study of the relation between the heat increment of gestation (or incubation) and birth weight of offspring for various species of animals gave evidence that the amount of extra heat produced during gestation above the nongestation resting level may be expressed by the following equation, $Q=aM^n$, in which Q represents calories of heat and M the birthweight in kilograms. The numerical value of a is 4,400, and the exponent n is of the order of 1.2. Evidence is weighed to indicate that Rubner's "law of surface area" does not apply to prenatal growth.

Correlation of body measurements of slaughter steers with rate and efficiency of gain and with certain carcass characteristics, W. H. Black, B. Knapp, Jr., and A. C. Cook. (U. S. D. A.). (*Jour. Agr. Res.* [*U. S.*], *56* (*1938*), *No. 6, pp. 465–472, figs. 2*).—In a study at Beltsville, Md, with 50 record-of-performance steers of beef, dual-purpose, and dairy breeding, 9 body measurements were taken prior to slaughter at live weight as nearly 900 lb. as possible. The correlation of each of these measurements and of certain ratios of measurements to efficiency of gain, average daily gain, dressing percentage, percentage of fat in carcass, percentage of total edible meat, and slaughter grade of the animals was determined. Height at withers appeared to be one of the best measurements of performance, although length of body had a slightly higher correlation with efficiency of gain and average daily gain. A ratio of weight to height at withers gave a higher correlation with performance factors than any other ratio for the number of measurements taken. Slaughter grade proved to be a better measure of beef type than any ratios of measurements, indicating that measurements should not replace but should supplement reliable slaughter grades.

The use of alfalfa and native grass pasture in producing finished cattle, M. L. Baker (*Nebraska Sta. Bul. 315* (*1938*), *pp. 16, figs. 6*).—This bulletin presents the data and conclusions drawn from 3 years' studies in which yearling steers were full-fed on alfalfa pasture or on native grass pasture for a part of the feeding period and then finished in dry lot in comparison with similar steers full-fed in dry lot for the entire feeding period. The length of the grazing phase of the trials varied from 70 to 140 days and the total feeding period from 154 to 182 days in the three trials.

Steers fed on alfalfa pasture required less concentrates and alfalfa hay per unit of gain than those in either of the other lots. Compared with the dry-lot group, 1 mo. of alfalfa pasture per steer had a replacement value of 263 lb. of alfalfa hay and 41 lb. of concentrates, equivalent to 1.5 tons of alfalfa hay and 425 lb. of cencentrates per acre of alfalfa. Compared with the native grass group, 1 mo. of alfalfa pasture per steer replaced 27 steer days on native grass pasture plus 46 lb. of alfalfa hay and 42 lb. of concentrates. Steers on native grass required less alfalfa hay but about the same amount of cencentrates per unit of gain as the dry-lot group, so that on the average 1 month's native grass pasture per steer replaced about 240 lb. of alfalfa hay. On the basis of rapidity and economy of gains and the market desirability of the cattle produced, the use of good alfalfa and native grass pastures under these conditions compared favorably with dry-lot feeding for the entire period.

Fattening steers of different ages on pasture, with and without grain, and influence of method on quality of meat, C. I. Bray. (Coop. U. S. D. A.). (*Louisiana Sta. Bul. 296* (*1938*), *pp. 43, figs. 4*).—The results of six series of experiments are presented. Four tests from 1928 to 1931 comparing the net returns secured from yearling and 2-year-old steers fattened on grass alone v. those fed grain on pasture showed that the grain-fed steers consistently commanded a higher selling price and that in 3 yr. out of 4 they gave a higher net return. Finishing cattle on grass alone is recommended when there is an abundance of cheap pasture and feed prices are high and when the market will not pay more than from 25 to 50 ct. per hundredweight premium for grain-fed cattle. Brewers' rice and cottonseed meal or a mixture of corn, rice bran, and molasses with cottonseed meal proved practically equal to corn and cottonseed meal as concentrate rations for fattening steers on pasture. With reference to the importance of grass, it was concluded that regardless of the method used in finishing cattle, the improvement of pastures is the

most important single item in profitable beef production in Louisiana. Studies on the quality of meat, in cooperation with the U. S. Department of Agriculture, gave evidence that meat from the grain-fed cattle was more tender, of a slightly finer texture, and more desirable in aroma. Grain feeding also increased the percentage of fat in the edible part of the rib cut by about 60 percent and gave a fat of less intense and more desirable flavor. There was little difference in the flavor of lean meat from the two groups, and the lean from grass-fed cattle averaged only slightly darker in color than that for the grain-fed lots.

Wintering beef cows on the range with and without a supplement of cottonseed cake, W. H. Black, J. R. Quesenberry, and A. L. Baker (Coop. Mont. Expt. Sta.). (*U. S. Dept. Agr., Tech. Bul. 603 (1938), pp. 22, figs. 7*).—Experiments with over 500 Hereford breeding cows were conducted at the Range Livestock Experiment Station at Miles City, Mont., from October 1929 to October 1934 to determine the effect of winter gains, feed costs, and subsequent calf crop of wintering cows on the range without supplement and with a supplement of cottonseed meal. During this period the winters were generally mild and favorable for maximum use of the range, while the summers were hot and dry with grazing below normal. During the periods when cattle were removed from the winter range 1 lb. of cottonseed meal per cow per day replaced approximately 10 lb. of hay fed in dry lot. A summary of three trials during which cows were kept on the range all winter showed a combined winter and summer weight loss of 19.1 and 32.2 lb. per cow, average birth weights of calves of 76 and 74.1, average weaning weights of calves of 372.4 and 358.8, average yearly feed and range costs of $5.73 and $3.70, and average feed costs per 100 lb. of calf at weaning time of $1.80 and $1.20 for the cottonseed meal and no-supplement groups, respectively. The cottonseed meal proved a valuable supplement on the native range, but for economical production its use should be limited to seasons in which winter range conditions are severe.

Creep feeding and finishing beef calves, B. R. Taylor, O. S. Willham, and L. E. Hawkins (*Oklahoma Sta. Bul. 235 (1938), pp. 21, figs. 6*).—The results are presented for two experiments comparing feed consumption, the rate of gain, and cost of production of creep-fed and noncreep-fed calves during the suckling period and of four experiments comparing the rate and economy of gain and net returns over feed costs for creep-fed and noncreep-fed calves during the finishing period (average, 163 days). On the average, creep-fed calves were about 35 lb. heavier at the beginning of the finishing period and were noticeably fatter during the first part of the feeding period. The noncreep-fed calves made more rapid daily gains, weighing only 14 lb. less than the creep-fed calves when marketed. There was little difference in shrinkage during transit and in net selling price per hundredweight for the two groups, although the creep-fed calves averaged nearly 2 percent higher in dressing percentage. It appeared that creep feeding did not pay for calves that were full fed for 5 mo. or more after weaning. Creep feeding offers certain advantages for the producer of feeder calves in that he can offer a heavier, more uniform group of calves that will shrink less at weaning and start on feed more easily for the new owner.

The influence of climate and grazing on spring-fall sheep range in southern Idaho, G. W. Craddock and C. L. Forsling (*U. S. Dept. Agr., Tech. Bul. 600 (1938), pp. 43, pls. 3, figs. 19*).—The U. S. Sheep Experiment Station near Dubois, Idaho, studied the influence of climate and grazing on (1) the periods of range use, (2) forage production, and (3) the condition and yield of range sheep over a 9-yr. period, 1924–32.

Monthly mean temperatures ranged from 17.69° F. in January to 69.36° in July, with the average temperature remaining above 40° from April 10 to October 20. Precipitation averaged 10.18 in. annually, with 2 of the years well above the average, 3 about average, and 4 distinctly below average. The start of forage growth in the spring ranged from March 20 to April 24, while 2-in. height growth was reached on the approximate average date of April 22. The total volume of forage produced varied from 41 percent above to 33 percent below the 9-yr. average, largely due to the amount of winter and spring precipitation. The basal area of perennial grasses in protected quadrate declined 19 percent from 1923 to 1932, due primarily to the breaking up of large clumps following severe drought. Aside from climatic influences the intensity and periods of grazing had a profound effect upon the grazing value of the spring-fall ranges. The degree of depletion on the ranges was approximately directly proportional to the intensity of spring use, heavy spring grazing resulting in a marked increase in density of relatively unpalatable sagebrush and other shrubs, a decrease in density of highly palatable weeds and bunch grasses, and a delay in the date of occurrence of 2-in. growth. Ranges from which a high percentage of available forage was utilized in the fall, but none in the spring definitely improved in desirable herbage and decreased in sagebrush and other shrubs.

A rotation system of grazing whereby approximately from 30 to 35 percent of available bunch grasses were utilized in the spring after the 2-in. growth stage was reached and about 33 percent were utilized in the fall, or up to 65 percent for the year as a whole, maintained a range in good productive condition. Average carrying capacity of the range under these conditions was about 1.5 acres per sheep per month for 2.5 mo. in the spring and again in the fall.

Proso as a fattening feed for swine, J. W. Wilson and T. Wright (*South Dakota Sta. Bul. 316 (1938), pp. 7*).—The results of four series of pig fattening trials, comparing shelled corn, ground barley, and ground proso millet seed, are summarized. Tankage, alfalfa hay, and a mineral mixture supplemented the grain in each trial, and all feeds were fed by the free-choice method.

In the first trial, medium-ground red proso proved to have only 60 percent of the feeding value of shelled corn. In the three subsequent trials finely ground red proso was about 93 percent as valuable as shelled corn, and the consumption was practically the same on the two types of ration. In two trials in which both ground red proso and ground white proso rations were included, considerably more grain and also more tankage was consumed per 100 lb. of gain on the white proso ration. Barley appeared to be intermediate between shelled corn and ground red proso in feeding value.

Rate of salt absorption in curing pork, P. T. Ziegler and R. C. Miller (*Pennsylvania Sta. Bul. 355 (1938), pp. 20, figs. 8*).—Fresh bacons and hams of varying weight, thickness, and degree of fatness were subjected to dry cure and brine (sweet pickle) cure for varying lengths of time and at different temperatures (both controlled and uncontrolled). Data are presented on the average salt content, flavor, and shrinkage resulting under the various curing conditions and the distribution of salt in hams at the end of the cure and after aging.

A range of temperature of 35°–60° F. did not appreciably affect the rate of salt penetration in dry curing, but more rapid salt penetration occurred at 45°–50° than at 34° in sweet pickle. Salt absorpton by the fat was slow, major salt movements taking place from the cushion side of the hams and the rib side of the bacons. Skin-back hams dry cured more rapidly than those with all the fat and skin left on, but no difference between the two was noted in sweet pickle.

Seven days per inch of thickness proved the minimum number of days in which hams and bacon should remain in dry cure, while hams were properly cured after 11 and 9 days per inch of thickness through the H-bone in 75° and 85° sweet pickle, respectively. A higher and more even flavor was secured by aging bacon two weeks and hams four weeks after smoking.

Stallion enrollment.—XIX, Report of stallion enrollment board for the year 1937, with lists of stallions and jacks enrolled (*Indiana Sta. Circ. 234* (*1937*), *pp. 43, fig. 1*).—A directory of enrollments and renewals issued from January 1 to December 31, 1937, classified by counties, is given, together with a summary of all enrollments (E. S. R., 62, p. 867). Pertinent information regarding the State stallion enrollment law is also set forth.

Twenty-first annual report, 1936, [by the] Oklahoma Livestock Registry Board (*Oklahoma Sta. Circ. 82* (*1937*), *pp. 64*).—This report of the Oklahoma Livestock Registry Board for the year ended December 31, 1936, lists the registered purebred stallions and purebred jacks in the State and also all stallions and jacks licensed during the year, classified according to counties.

[Poultry investigations in New Jersey] (*New Jersey Stas. Rpt. 1937, pp. 20, 21, 22, 23, 92–97, 99–102*).—Findings briefly reported include those dealing with the vitamin A requirements of laying hens; fat requirements and metabolism of the chicken; changing trends in egg production, performance, and mortality in egg-laying contests; the correlation between weight of egg and weight of chick; increasing egg size of the flock by selecting hatching eggs of a 26-oz.-to-the-dozen minimum weight; methods of measuring egg size quality in the breeding stock; sex-linked inheritance in Rhode Island Red male × Barred Plymouth Rock female crosses; variations in eggshell color in a strain of Rhode Island Reds; crossbreeding for meat production; the economy of White Leghorn capon production; the effect of hatching date on growth and egg production of White Leghorns; the effect of slow, medium, and fast growth rates on White Leghorn pullets; and the efficiency and economy of egg production by Khaki-Campbell ducks.

Growth and development, with special reference to domestic animals.—XLIV, Energetic efficiency of egg production and the influence of live weight thereon, S. Brody, E. M. Funk, and H. L. Kempster (*Missouri Sta. Res. Bul. 278* (*1938*), *pp. 59, figs. 17*).—Continuing this series (E. S. R., 79, p. 230), data were collected on the feed consumption, egg production, body weight, and body weight gains on 174 White Leghorn and 115 Rhode Island Red hens during a 3-yr. period. The birds were kept in individual compartments of laying batteries and fed a standard ration constantly. The energetic efficiency computations as presented were based on 2,237 complete 28-day experimental periods. Employing fuel values of 3 Calories per gram of feed consumed and 1.6 Calories per gram of whole egg, including shells, the gross energetic efficiency of egg production (ratio of egg energy produced to feed energy consumed) was estimated to be of the order of 11, 14, 17, 20, and 27 percent for 100, 150, 200, 250, and 360 egg producers, respectively. Maximum egg production occurred at a characteristic body weight of about 4 lb. in the Leghorns and about 5.75 lb. in the Rhode Island Reds and Barred Rocks. Preceding these weights of maximum production the gross energetic efficiency of egg production tended to be independent of body weight, while following these body weights the efficiency decreased. The gross energetic efficiency of good layers was about the same as the efficiency of early postnatal growth and about one-half that of the efficiency of milk production in good dairy cattle, although evidence was obtained to indicate that the net efficiency of egg production (not counting maintenance) is of the same order as that of milk production. Reasons for

the difference in gross efficiency of egg and milk production and prenatal growth in the chick are discussed.

The comparative value of cod-liver oil alone and in combination with irradiated ergosterol as a source of vitamin D for confined laying hens, R. B. Nestler. (U. S. D. A.). (*Jour. Agr. Res. [U. S.], 56 (1938), No. 3, pp. 209-219*).—In an experiment at Beltsville, Md., extending over a period of 11 mo., six pens of 18 pullets each were housed without access to direct sunlight and fed an all-mash ration containing 1.2 percent of phosphorus and 3 percent of calcium. Pens 1, 2, and 3 received vitamin D supplement in the form of 1, 2, and 8 percent of cod-liver oil, while pens 1A, 2A, and 3A also received 0.5 percent of 160 D irradiated ergosterol in each case.

The mixtures containing the irradiated ergosterol showed no superiority over the same quantities of unsupplemented cod-liver oil. The relatively high levels of vitamin D in the rations containing 1 or 2 percent of supplemented cod-liver oil produced no deleterious effects on the hens or their eggs. Feeding 8 percent of cod-liver oil either plain or supplemented had a pronounced deleterious effect on feed consumption and the production, average weight, total weight, yolk weight, and hatchability of eggs, and also resulted in yolks lighter in color than where lower levels of cod-liver oil were fed. The various rations produced no significant differences with reference to average weight, thickness, and strength of eggshells; thickness of shell membranes; albumin weight; percentage of thick albumin; or fertility of total eggs set.

Some effects of feeding yeast fermented mash to laying pullets, R. S. Dearstyne and C. O. Bollinger (*North Carolina Sta. Tech. Bul. 55 (1938), pp. 18*).—Results are reported on three series of tests, each over a period of 3 yr., to determine the effect on total egg production and on egg size of feeding a portion of the daily diet of laying hens as yeast-fermented mash. Fermentation was accomplished by adding 1 percent dried live yeast product to the mash, wetting, and holding for from 16 to 18 hr. at a constant suitable temperature. In test 1 with White Leghorns (sister for sister in respective lots) in which the basal diet was common to both control and test pens and in which the control pen was fed an equivalent amount of wet mash per bird to yeast-fermented mash in the test pen, the control and test pens averaged 195 and 200 eggs per bird and consumed 41.9 and 42.9 lb. of grain and 39.9 and 41.6 lb. of mash, respectively. Differences in mortality were not significant. In test 2 with Rhode Island Reds in which the basal diet was common to both pens with the test pen receiving a supplementary feeding of fermented mash, the control and test groups averaged 140 and 150 eggs, respectively. The test group consumed more mash and as much grain as the control. In both the first and second tests the test birds came into production earlier than the controls and maintained higher production throughout the trial. In test 3, comparing supplementary feedings of (1) wet mash, (2) wet mash with 1 percent killed yeast, (3) wet mash with 1 percent live yeast, and (4) yeast-fermented mash, the average production was 169, 168, 176, and 179 eggs, respectively. Mortality in pen 4 was relatively lower than in the other pens. A comparison of egg weights in test 1 revealed no significant differences between the control and test lots.

Amounts of protein supplements in rations for broilers, R. E. Roberts and C. W. Carrick (*Indiana Sta. Bul. 425 (1937), pp. 19, fig. 1*).—Five experiments, involving a total of 13 lots of chicks, were conducted to compare the effectiveness of various mixtures of meat and bone scraps and dried skim milk and of those ingredients plus soybean oil meal as protein supplements in rations for broilers. Data are presented on the average weight of males and females on the different rations at 4, 6, 8, 10, and 12 weeks of age, and of the feed consumed per 100 chicks and per pound of gain.

The rate of growth of the chicks increased as the level of protein was increased up to approximately 20 percent, or the amount contained in 10 percent meat and bone scraps, 10 percent soybean oil meal, and 5 percent dried skim milk. There was little difference in the feed required per unit of gain on the different rations and no difference in mortality attributable to the rations. The higher protein rations were considered advantageous, since a given weight could be obtained in a shorter time with little difference in the feed costs per unit of gain.

Influence of temperature and humidity upon the growth of chick embryos in a mechanically ventilated incubator, R. PENQUITE (*Iowa Sta. Res. Bul. 232* (*1938*), *pp. 39, figs. 10*).—In studying the effect of humidity on embryonic growth, eggs were incubated at relative humidities of 40, 62, and 80 percent and at a constant temperature of 99.7° F. Within this range relative humidity did not exert a significant effect on the growth of embryos as measured by the wet weight, dry weight, or total nitrogen (determined daily from the fourth to twentieth days of incubation). A significant difference was observed on the sixteenth, seventeenth, and eighteenth days between the total ash of embryos incubated at the various humidities, indicating that the 62 percent level was preferable. The dry weight of the embryos was considered the best of these four measurements of growth. Loss of moisture from the egg during incubation was influenced not only by the temperature and humidity of the egg chamber but also by circulation of air around the egg, shell texture, and the thickness and surface area of the shell. A comparison of incubation temperatures of 104.9° and 99.7° gave evidence of more rapid growth (dry-weight basis) at the higher temperature during the first 10 days of incubation. Growth rates were practically equal when a mechanically ventilated incubator was operated at 2° lower temperature than a sectional-type machine, emphasizing that the type of incubator governs the temperature and humidity at which it should be operated.

Resistance of chicken embryos to mechanical disturbances, M. W. OLSEN and T. C. BYERLY. (U. S. D. A.). (*Jour. Agr. Res.* [*U. S.*], *56* (*1938*), *No. 3, pp. 221–226, figs. 4*).—In a study eggs removed from the incubator at various stages of incubation were shaken in a mechanical shaker, centrifuged, jarred against the operator's palm, or placed in close proximity to dynamite blasts. Chick embryos could be killed by such mechanical disturbances. Eggs shaken parallel to the short axis showed higher embryonic mortality than those shaken parallel to the long axis, and applying either centrifugal or jarring force to the large end of the eggs gave greater mortality than when applied to the small end. Embryos were most affected by shock from the fourth to the fifteenth day of incubation. Broken yolk sacs, ruptured blood vessels, and tremulous air cells were the chief causes of mortality. Careful handling from the fourth to the fifteenth day of incubation is recommended.

Phosphorus content of the yolk of fresh and storage eggs, S. E. ERIKSON, R. E. BOYDEN, W. M. INSKO, JR., and J. H. MARTIN (*Kentucky Sta. Bul. 378* (*1938*), *pp. 24*).—Continuing the study of factors that may affect the nutritive quality of eggs (E. S. R., 70, p. 820), total, inorganic, and acid-soluble phosphorus were determined in a large number of yolks from fresh and storage eggs (in storage 12 mo.) which were produced under control conditions to test the effect of administration to hens of cod-liver oil, sunshine, and bluegrass singly and in combinations. Any one of these vitamin D supplements tended to increase the inorganic phosphorus of yolks, and the three in combination had a more pronounced effect than any one singly. The supplements also had a tendency to increase total and acid-soluble phosphorus, but the effects were

neither so marked nor so consistent as with inorganic phosphorus. The ratio of acid-soluble to total phosphorus was higher in storage eggs than in fresh eggs from all pens, and this condition apparently was unrelated to vitamin D supplements in the diet.

Improving the keeping quality of eggs by cleaning with sodium hydroxide, E. M. FUNK (*Missouri Sta. Res. Bul. 277 (1938), pp. 40, figs. 11*).—Two studies were conducted to determine the keeping qualities of naturally clean eggs and dirty eggs cleaned by washing with a dilute solution of sodium hydroxide and held in storage. A portion of the eggs was removed from cold storage each month, candled, graded, and broken out for grading on appearance and edible qualities. The lots of eggs remaining after 8 to 10 months' storage were sold on a city market.

The soiled eggs cleaned with sodium hydroxide solution kept equally well, commanded as good prices on the market, and possessed edible qualities fully equal to the clean eggs stored under like conditions. A test comparing the keeping quality of dirty eggs washed in water, in chlorine solution, in water and then dipped in chlorine solution, and in ethyl alcohol, with those washed in sodium hydroxide solution clearly demonstrated the superiority of the latter as a cleansing agent. It is also shown that the bacterial content of frozen eggs was significantly reduced by cleaning the eggs with sodium hydroxide solution before the eggs were broken out. The necessity of maintaining the washing solution at a proper strength is emphasized.

Improving the keeping quality and the market value of eggs by proper cleaning, E. M. FUNK (*Missouri Sta. Bul. 394 (1938), pp. 15, figs. 3*).—A popular report of the research described above.

Methods of feeding turkeys, J. S. CARVER, L. A. WILHELM, and J. W. COOK (*Washington Sta. Bul. 356 (1938), pp. 16, figs. 3*).—Three methods were employed in these turkey feeding trials, namely, (1) mash and scratch grains, (2) 75 percent mash and 25 percent pellets (same composition as mash) and scratch grains, and (3) pellets and scratch grains. All birds were changed from the starting to a developing mash at 8 weeks, from a starting to a developing scratch ration at 12 weeks, and from developing to finishing scratch grains at 25 weeks. All birds had access to green range after 8 weeks of age.

No significant differences were noted at 28 weeks in body weight, average dressed weight, or market grade of either hens or toms fed by the respective methods. Birds from 2 to 10 days of age showed a preference for pellets over the mash ration. Total feed consumption per bird over the 28-week period was 99.96, 97.42, and 93.21 lb., the average feed cost was $2.28, $2.24, and $2.16, and the average returns over feed cost were $2.28, $2.23, and $2.38 for birds fed by the first, second, and third methods, respectively. All birds consumed 19 percent scratch grain and 81 percent mash from the twelfth to the sixteenth weeks as compared with 72 percent scratch and 28 percent mash during the last 4 weeks of the trial. The protein content of the feed consumed averaged only 13 percent at the end of the twenty-eighth week. Cooking tests failed to reveal either fishy flavor or off-odors in the roasted carcasses.

The influence of various factors on egg production in turkeys, V. S. ASMUNDSON. (Calif. Expt. Sta.). (*Jour. Agr. Res.* [*U. S.*], *56* (*1938*), *No. 5*, *pp. 387–393*).—In a statistical analysis of the first-year egg records of 238 April- and May-hatched turkeys, egg production was not significantly influenced by the date of hatch but was correlated with date of last egg (persistency), date of first egg (sexual maturity), length of broody and nonbroody pauses of

7 days or more, and net spring rate (percentage production during March and April). The coefficients of multiple correlation showed that these four factors accounted for all, or nearly all, of the variance in first-year production, ranking in relative importance in the order given. There was no correlation between date of first egg, date of last egg, and net spring rate, but date of last egg and length of pauses were found to be correlated.

DAIRY FARMING—DAIRYING

[Investigations with dairy cattle and dairy products in New Jersey] (*New Jersey Stas. Rpt. 1937, pp. 21, 22, 43–47, 50, 51*).—Included are results of studies dealing with color pigmentation in the skin and milk of Guernsey cattle; the milk and butterfat production of inbred and outcrossed Holstein cattle; the value of a kelp preparation in the ration of heifers and of milking cows; the effect of processing on the carotene content of certain field crops; the relation of carotene content to vitamin activity in the feeds; molasses grass silage as the sole ration for milking cows; the relation of grass silage to color and flavor in milk; the relation of color, vitamin C, and copper in milk from individual cows to the flavor of that milk; the influence of season and feeding conditions on the chemical and physical properties of milk; the vapor-vacuum sealing of milk as related to its flavor and keeping quality; and methods for the assay of vitamin D milk.

[Experiments with dairy cattle in South Carolina] (*South Carolina Sta. Rpt. 1937, pp. 64–67, 144–146, fig. 1*).—Results are presented on the effects of feeding chopped hay or various amounts of concentrates to milking cows on the returns obtained from Bermuda grass pasture, by G. H. Wise and J. P. LaMaster; and an analysis of the production records of the daughters of a proved dairy sire, by E. W. Faires.

[Investigations with dairy cattle and dairy products in Washington]. (Partly coop. U. S. D. A.). (*Washington Sta. Bul. 354 (1937), pp. 28–33*).—The reports of dairy cattle studies, by R. E. Hodgson, J. C. Knott, H. K. Murer, R. R. Graves, E. L. Overholser, and E. V. Ellington, include the nutritive value of home-grown hay and silage rations for dairy cattle, and the composition and digestibility of silage made from cull apples and alfalfa hay 80:20.

Studies with dairy products, by H. A. Bendixen, C. C. Prouty, N. S. Golding, E. C. McCulloch, and Ellington, gave information on the relationship of certain factors to the keeping quality of salted butter stored at 0°–5° C. for 1 mo., the physiological requirements of certain strains of *Penicillium roqueforti*, and the bacterial development in milk from mastitis-infected quarters and its effect on the quality of milk and its products.

Limited-grain feeding and all-year pasture for dairy cows, C. E. Wylie and L. R. Neel (*Tennessee Sta. Bul. 163 (1938), pp. 10, figs. 4*).—Four years' results are summarized comparing the feed consumption, milk production, and income over feed costs of a milking herd receiving all-year pasture and a limited grain ration (1 lb. of grain per 6 lb. of milk) with a herd receiving only summer pasture and a full grain ration (1 lb. of grain to 3 lb. of milk). The limited grain-fed group on pasture an average of 346 days per year consumed 47 percent less grain, 17 percent less hay, and 13 percent less silage, produced 97 percent as much milk and butterfat, and showed 11 percent higher income over feed costs per cow per year than the full-fed group on pasture an average of 198 days per year. Data from other sources are presented confirming the value of an all-year program of good pasture in economical milk production.

Feeding dairy cows on alfalfa hay alone, R. R. GRAVES, J. R. DAWSON, D. V. KOPLAND, A. L. WATT, and A. G. VAN HORN (*U. S. Dept. Agr., Tech. Bul. 610 (1938), pp. 47, figs. 5*).—In trials at 4 dairy field experiment stations, 15 Holstein-Friesian cows were fed through 26 complete lactation periods solely on good-quality alfalfa hay, with salt and bonemeal as the only supplements. The average annual production on such rations was 11,125 lb. of milk and 390 lb. of butterfat (mature basis), which represents approximately 60 percent of the mature equivalent production of these same cows when fed a liberal grain ration in addition to roughage. The average consumption of alfalfa hay per lactation was 14,352 lb. or 1.3 lb. of hay for each pound of milk produced. On both rations the cows consumed somewhat more total digestible nutrients for the lactation period than was required for maintenance and milk production. The nutrients in alfalfa hay were used as efficiently for milk production as were the nutrients in the mixed ration. Apparently the alfalfa hay supplied ample amounts of calcium and phosphorus since very little bonemeal was consumed and no symptoms associated with depraved appetite or lack of appetite were observed. Continuous feeding of alfalfa hay as the sole ration over two or three complete lactation and gestation periods had no detrimental effect on fertility, breeding, or calving conditions of the cows.

Hay consumption of Holstein calves, H. S. WILLARD. (Wyo. Expt. Sta.). (*Jour. Dairy Sci., 21 (1938), No. 3, pp. 153–160, figs. 6*).—Holstein calves weaned from milk at about 3 mo. of age made approximately normal gains when fed a limited amount of grain and liberal quantities of high quality alfalfa hay. The average daily consumption of hay was above 6 lb. per head at 6 mo. of age and above 10 lb. at 9 mo. of age. Calves fed hay alone after 9 mo. continued to make desirable growth and were consuming over 18 lb. per head daily at 1 yr. of age.

Cod-liver oil tolerance in calves, G. K. DAVIS and L. A. MAYNARD. ([N. Y.] Cornell Expt. Sta.). (*Jour. Dairy Sci., 21 (1938), No. 3, pp. 143–152*).—Ten dairy calves were reared on a skim milk, hay, and grain ration supplemented with different levels of cod-liver oil ranging from 0.1 to 0.7 g per kilogram of live weight daily. Calves receiving each level of cod-liver oil feeding were sacrificed at 26 weeks of age for post-mortem examination, while the remaining calves were carried on experiment to 40 weeks of age. There was no indication that the oil adversely affected the growth or physical condition of the calves. Post-mortem examination failed to show any gross changes indicative of cod-liver oil injury, and histological examination revealed only slight dystrophic changes in the muscles. Evidently sufficient cod-liver oil to supply optimum levels of vitamin D may be safely fed to calves.

The use of yeast in calf meals and pellets, P. E. NEWMAN and E. S. SAVAGE (*Jour. Dairy Sci., 21 (1938), No. 3, pp. 161–167, fig. 1*).—These studies compared the effectiveness of a previously recommended dry calf-starter ration (E. S. R., 73, p. 673) with five modifications of the mixture, in which (1) 6.25 percent of dried brewers' yeast replaced an equivalent amount of cereal grain, (2) 16 percent of cereal yeast feed replaced 10 percent of dried skim milk and cereals, (3) 5 percent of cereal yeast feed and 5 percent of soybean oil meal replaced 10 percent of dried skim milk, (4) 9 percent of soybean oil meal plus corn replaced 10 percent of dried skim milk, and (5) the dried skim milk was increased to 30 percent. The dry calf-starter method consistently produced thrifty, desirable calves above normal in weight. The use of the dried yeast and cereal yeast feed in the formula resulted in somewhat greater gains and a slightly lower total digestible nutrient requirement per unit of gain. Replacing one-half of the dried skim milk as indicated in rations 2 and 3 did not decrease

their effectiveness, while ration No. 5 proved less palatable and produced slower growth than the check ration. Calves receiving the check and No. 1 rations in pelleted form consumed less feed and grew somewhat slower than calves on the respective meals.

[Progress in dairy chemistry], W. L. DAVIES (*Jour. Dairy Res.* [*London*], *9* (*1938*), *No. 1, pp. 95–120*).—This review records the progress in dairy chemistry for a period extending from the end of that dealt with in a previous report [3] to August 1937. The bibliography includes 226 references.

[Experiments with dairy products in Connecticut] (*[Connecticut] Storrs Sta. Bul. 221* (*1937*), *pp. 31, 32, 33*).—Studies for which findings are reported include the use of sodium alginate as a stabilizer for ice cream, a comparison of oscillation (sonic vibrator) and homogenization in processing ice cream mixes, the effect of acidity on the development of oxidized flavor in pasteurized milk, and the effect of electromagnetic oscillation on the curd tension of milk.

The vitamin A value of colostrum and milk of four cows, determined by the single-feeding method, M. M. KRAMER, M. D. BAIR, B. L. KUNERTH, and W. H. RIDDELL. (Kans. Expt. Sta.). (*Jour. Agr. Res.* [*U. S.*], *56* (*1938*), *No. 3, pp. 227–232, figs. 2*).—The vitamin A potency of the colostrum of milk of two cows receiving a regular winter dairy ration and of two cows receiving green rye in addition to the regular ration was determined. Samples were taken on the first and second days and at intervals up to the twenty-fifth or twenty-sixth days of lactation and were assayed by the single-feeding biological method. The secretions of the first day contained 25 and 28 international units of vitamin A per gram for the cows receiving rye and 16 and 20 international units for the others. There was a sharp drop in the vitamin A value during the first few days of lactation, but beyond the sixth or seventh days it was maintained at a near constant level to the end of the period, approximating 2 international units per gram. In general, the rapid drop in vitamin A value per gram of sample was paralleled by the drop in vitamin A value of the total yield per cow per day.

Vitamin G (riboflavin) content of colostrum and milk of cows determined biologically, M. M. KRAMER, I. GARDNER, B. L. KUNERTH, and W. H. RIDDELL. (Kans. Expt. Sta.). (*Jour. Agr. Res.* [*U. S.*], *56* (*1938*), *No. 3, pp. 233–237, figs. 2*).—In further studies milk samples collected from two Jersey and two Holstein cows on the first, fifth, and thirtieth days of lactation and regular mixed herd samples were biologically assayed for vitamin G (riboflavine) content. The first-day samples were richest in vitamin G, containing 4.2 µg to 6.7 µg per gram of sample. Samples from all cows on the thirtieth day of lactation and also the mixed herd sample contained approximately 2 µg of vitamin G per gram, while samples of the fifth-day milk were approximately 50 percent higher than later milk from the same cows or the regular herd milk.

A lipase (tributyrinase) of cow's milk.—I, Occurrence, method of estimation, and relationship to lactation cycle, E. C. V. MATTICK and H. D. KAY (*Jour. Dairy Res.* [*London*], *9* (*1938*), *No. 1, pp. 58–71, figs. 6*).—A method is described for determining the tributyrinase activity of a given milk or fluid. This enzyme was found in all samples of fresh cows' milk examined, existing in the aqueous rather than the fatty portion of the milk. It had an optimum range of activity at pH 8.2 to 8.7 and was more thermolabile than the enzyme phosphatase. While the concentration in milk varied considerably between individual cows, definite trends in relation to the lactation period were observed. The content was highest in colostrum, dropped to a minimum at about 10 days

[3] Jour. Dairy Res. [London], 7 (1936), No. 1, pp. 75–96.

lactation, rose to an intermediate level after a short time, and remained at a rather constant level throughout the remainder of the lactation period. Tributyrinase has many points in common with true lipase of milk but apparently is unrelated to milk phosphatase.

Relation of color and ascorbic acid to flavor in milk from individual cows, O. F. Garrett, H. H. Tucker, and F. C. Button. (N. J. Expt. Stas.). (*Jour. Dairy Sci., 21 (1938), No. 3, pp. 121–126*).—Individual milk samples taken from 16 Guernsey and 12 Holstein cows at weekly intervals over a period of approximately 4 mo. were tested for butterfat content, flavor score, ascorbic acid content, and color. The following coefficients of correlation between these factors were obtained: Color and percentage of butterfat 0.8702, color and first-day ascorbic acid 0.6847, color and first-day flavor 0.7339, color and third-day flavor 0.6039, first-day ascorbic acid and first-day flavor 0.6996, first-day ascorbic acid and third-day flavor 0.5779, and third-day ascorbic acid and third-day flavor 0.5843. Apparently high carotene and high ascorbic acid are coincidental and help to preserve good flavor in milk.

The protein distribution in normal and abnormal milk, S. J. Rowland (*Jour. Dairy Res. [London], 9 (1938), No. 1, pp. 47–57*).—Using the methods of determination described on page 295, the nitrogen distribution of normal milk, milk from cows with mastitis, and milk persistently low in solids-not-fat was studied. Normal milk samples contained on the average total protein 3.18 percent, casein 2.63, albumin 0.31, globulin 0.11, and proteose-peptone substances 0.13 percent. Milk from mastitis-infected cows was low in solids-not-fat content and was characterized by a decreased casein content and an increase in other protein fractions, particularly globulin. Milk of low solids-not-fat content produced by apparently healthy cows was carefully examined for the presence of mastitis streptococci as well as for nitrogen distribution. It is concluded that subclinical mastitis accounted for a large proportion of these widespread and puzzling cases. Milk from cows having subclinical mastitis had a protein distribution similar to typical mastitis milk, while samples low in solids-not-fat from noninfected cows had a protein distribution typical of normal milk.

Relation between lactose and ash content of the milk of different mammals, P. F. Sharp (*Jour. Dairy Sci., 21 (1938), No. 3, pp. 127, 128, fig. 1*).—Based on a compilation of data from numerous sources, the relation between the lactose and ash content of the milk of 22 different species of mammals is graphically presented.

The chemical composition and properties of normal and rancid Jersey milk.—I, Chloride and lactose content, R. Reder. (Okla. Expt. Sta.). (*Jour. Dairy Sci., 21 (1938), No. 4, pp. 199–211, figs. 3*).—In a study extending over a period of 2 yr., weekly milk samples from individual mastitis-free cows in the station Jersey herd were scored for flavor and analyzed for lactose and chloride content. Milk of normal flavor showed a gradual increase in chloride and a slight decrease in lactose content with advance of lactation, these trends being more pronounced after the fortieth week. Milk from cows frequently producing rancid milk had a higher chloride and a lower lactose content than normal milk produced in the same stage of lactation. Rancid milk showed a high chloride-lactose ratio which seemed characteristic of all milk produced by cows whose milk was frequently rancid. Rancid, salty, and normal samples contained an average of 0.114, 0.134, and 0.098 percent chloride, respectively.

Bound water and its relation to some dairy products.—I, The bound water content of some milk products and other products used in the dairy industry, H. Pyenson and C. D. Dahle. (Penn. Expt. Sta.). (*Jour. Dairy Sci., 21 (1938), No. 4, pp. 169–185*).—Employing essentially the same methods for

making bound water determinations as described by Newton and Gortner (E. S. R., 51, p. 26), the authors determined the amount of water bound by the various constituents of milk and the bound water content of milk and certain milk products, fat globule membrane, pure milk and egg phospholipids, and some gums and stabilizers used in the dairy industry.

The bound water in whole milk of average composition varied from 2 to 3.5 percent. Approximately 50 percent of the total amount was bound by the casein, 30 by the albumin, 15 by the fat globule membrane, and less than 4 percent by the remaining solids. Rennet casein appeared to bind somewhat more water than acid casein. Dialyzed and natural whey proteins bound approximately the same amount of water, more being bound at pH 6.6 than at pH 4.7. Casein and fat globule membrane each bound approximately 0.6 g of water per gram of solids. The bound water in cream was largely due to the hydrophilic properties of the fat globule membrane. Pure milk phospholipids were the most hydrophilic of any substances isolated from milk, exceeding pure egg phospholipids in this respect. The gums and stabilizers tested varied widely in hydrophilic properties.

Effect of pH on the production of acetylmethylcarbinol plus diacetyl in milk by the citric acid fermenting streptococci, M. B. MICHAELIAN, W. H. HOECKER, and B. W. HAMMER. (Iowa Expt. Sta.). (*Jour. Dairy Sci., 21 (1938), No. 4, pp. 213–218, figs. 7*).—This report deals with the relationship of different pH values as produced by various acids to the production of acetylmethylcarbinol plus diacetyl in milk cultures of the citric acid fermenting streptococcus. Methods previously described (E. S. R., 73, p. 232) were employed. When cultures were acidified with citric acid the yield of the carbinol plus diacetyl was always higher than when other acids were used, and a significant production occurred over a wider pH range with maximum production at pH 3.9 to 3.7. Acidifying with lactic acid gave comparatively low yields, restricted to a rather narrow pH range, with maximum yields at pH 4.4 to 4.1. Sulfuric acid as an acidulant gave higher yields than lactic acid and over a wider pH range, maximum production occurring at pH 3.6 to 3.2 A mixture of 0.15 percent lactic acid plus various amounts of sulfuric acid to give a desirable pH range gave yields similar to sulfuric acid alone, maximum yields occurring at pH 3.9 to 3.5.

The use of citric acid and sodium citrate in milk and milk products, H. L. TEMPLETON (*Wisconsin Sta. Res. Bul. 133 (1937), pp. 44, figs. 11*).—The results included in this bulletin are essentially a summation of material presented in four earlier publications, previously noted (E. S. R., 61, p. 564; 71, pp. 377, 693; and 73, p. 381).

Factors involved in accuracy of testing milk samples, I, II (*Michigan Sta. Tech. Bul. 158 (1938), pp. 36*).—Two articles are presented.

I. *Influence of heated and unheated testers on the Babcock test*, J. R. Fahl, P. S. Lucas, and W. D. Baten (pp. 3–22).—In this study 513 samples of milk were tested by the Mojonnier method and by the Babcock method with the centrifuge operated at a low temperature of from 60° to 68° F., a medium temperature of from 85° to 100°, and a high temperature of from 135° to 150°. After centrifuging, all samples were placed in a constant-temperature (138°) water bath for 5 min. before reading. The average percentages of butterfat were 3.675, 3.716, 3.745, and 3.757, respectively. These differences were deemed significant as was also the difference between the means of the percentage of fat remaining in the liquid portion below the fat column in Babcock tests at varying temperatures.

II. *Accuracy of the composite sample*, P. S. Lucas (pp. 23–36).—A comparison of the average of daily tests with the tests of bimonthly composite samples for 21 creamery patrons over a period of 5.5 mo. showed that the daily test averag

were consistently slightly higher than the tests of the composite samples (approximately 0.1 percent). It is recommended that composite samples should be brought to a temperature range of from 56° to 96° before measuring for the Babcock test in order to get results comparable to the daily average tests. The averages of 4 and 8 tests per month compared favorably with average daily tests, but are subject to certain discrepancies which are discussed.

Milk-bottle losses and ways to reduce them, C. E. CLEMENT (*U. S. Dept. Agr. Circ. 469 (1938), pp. 39, figs. 2*).—Data obtained in 111 milk plants indicated that the average life of the bottle was a little less than 35 trips. There was little difference in the averages for the quarts and for the smaller sizes although more quarts are broken in the milk plants. The average for 78 member plants in localities where an exchange was operated was 30.24 trips; for 6 plants where bottles were pooled and stray bottles were used, 47.32 trips; and for 17 plants where all bottles were charged to the driver and bottles also pooled in many cases, 57.13 trips. At 32 plants that charged the stores for bottles the bottle lasted 41.3 trips as compared with 22.55 trips for 46 plants that did not use a store bottle. At 13 exchange member plants that paid the drivers a commission for returned bottles and charged the stores for bottles, the average was 51.03 trips.

The operating cost for 67 exchanges from 0.13 to 3.17 ct. per bottle and averaged 0.64 ct. It was a little higher for the exchanges that trucked and washed the bottles than for those that did not. It was less at the larger than at the smaller exchanges as a rule. The number of men employed ranged from 1 man employed part time to 45 men at a large exchange.

The systems that are most widely used and have the fewest disadvantages are: Paying retail route men a commission for return of bottles, making a charge for all bottles delivered to stores at a price commensurate with their value, and the establishment of a milk-bottle exchange.

How should cream be held at the creamery?—A study on holding raw and pasteurized cream 40 hours, C. C. TOTMAN. (S. Dak. State Col.). (*Natl. Butter and Cheese Jour., 29 (1938), No. 8, pp. 34, 36, 37, figs. 4*).—This study compared the quality of butter churned from batches of cream handled in the following manners: (1) Neutralized to 0.25 percent acidity and pasteurized shortly after arrival at the creamery, cooled, and churned 4 to 15 hr. later; (2) neutralized and pasteurized as above, cooled, and held in cans in the refrigerator for 40 to 44 hr. at 35° to 45° F. before churning; and (3) held as raw cream in the refrigerator for 40 to 44 hr., neutralized to 0.25 percent acidity, pasteurized, cooled, and churned about 2 hr. later. Quality scores were made on the fresh butter and at intervals during the 6-mo. storage period.

Averaging all churnings during the year, butter produced under the second and third methods showed very similar scores. All cream handled by the first method yielded butter of lower quality, and the depreciation during the 3 to 6 mo. in storage was materially greater than in the other lots.

Bacterial content and keeping quality of butter after removal from storage, D. H. JACOBSEN. (S. Dak. Expt. Sta.). (*Jour. Dairy Sci., 21 (1938), No. 4, pp. 187–193*).—Butter samples (both salted and unsalted) from 15 churnings were examined for bacterial content and flavor while fresh, after 1 and 90 days at —25° C., and after 2, 4, and 7 days at 21°. Samples removed from cold storage after 90 days were similarly examined after 2, 4, and 7 days at 21°. Fresh salted butter showed a much lower bacterial count than corresponding fresh unsalted samples. Freezing at —25° markedly decreased the count of both salted and unsalted samples. No flavor changes could be detected in the butter samples held at this temperature for 90 days. Unsalted butter after

removal from storage showed more rapid increase in bacterial count and more rapid flavor deterioration when held at 21° than fresh unsalted butter. Large numbers of lipolytic and proteolytic bacteria were found in some of the unsalted samples held at room temperature. Subsequent to the storage period salted butter did not significantly increase in bacterial count, did not show lipolytic or proteolytic organisms, and did not develop flavor defects other than tallowiness when held at 21°.

Effect of aeration under pressure on diacetyl production in butter cultures, C. R. Brewer, C. H. Werkman, M. B. Michaelian, and B. W. Hammer (*Iowa Sta. Res. Bul. 233 (1938), pp. 41–56, figs. 2*).—A series of tests was conducted in which production of diacetyl was determined in butter cultures and pure cultures of citric acid fermenting streptococci, acidified to pH 3.8–4.0 and grown under pressures of 15, 30, and 60 lb. per square inch, unagitated, and agitated by aeration or by stirring.

Pressure without agitation was not effective in increasing the rate of diacetyl production and production at 15 lb. pressure with agitation was only slightly greater than that at atmospheric pressure. However, under 30 or 60 lb. pressure with agitation the production of the diketone was greatly increased, maximum production occurring at 60 lb. pressure, and such increases frequently amounted to several hundred percent. The high diacetyl content of butter cultures gave a high flavor and aroma, and butter churned with such cultures uniformly possessed a high flavor and aroma. The application of these results to possible new methods in butter-making practice are discussed.

Carotene in butter coloring. (Ohio State Univ.). (*Amer. Creamery and Poultry Prod. Rev., 84 (1937), No. 20, p. 614*).—In trials reported by R. B. Stoltz and T. S. Sutton, when uncolored winter butter and portions of the same butter receiving 15 drops of Smaco (carotene in oil) per pound were compared, 75 and 50 g, respectively, produced approximately the same total gains in rats. When winter butter colored with 2 cc of Primatene (a less concentrated carotene preparation) per pound was compared with uncolored June butter 45 g of the former and 30 g of the latter gave equivalent gains. These results indicate the impracticability of attempting to increase winter butter to a nutritive level of June butter. Approximately 4 oz. of Primatene per 100 lb. was required to give winter butter a desirable intensity of color.

Use of the dilatometer in measuring the extent of freezing in ice cream and related products, W. C. Cole (Calif. Expt. Sta.). (*Jour. Agr. Res. [U. S.], 56 (1938), No. 2, pp. 137–153, figs. 7*).—Employing a specially designed dilatometer, it was found that an expansion factor of 0.0933 cc per gram of water frozen gave calculated values in close agreement with freezing point data previously published. Freezing point data for sucrose solutions were secured at −25° C. or lower, supplementing data available in the International Critical Tables. Data based on dilatometer measurements are presented on the amount of ice formed in the freezing of 9 ice-cream, 3 ice-milk, and 4 water-ice samples. The manner in which these results may be applied to the commercial manufacture of ice cream and related products is suggested, since the quality of such products is greatly influenced by the amount of ice frozen at certain stages in their manufacture and distribution.

A comparison of fresh and frozen condensed skimmilk as a source of serum solids in ice cream, E. L. Reichart and R. T. Corley. (Nebr. Expt. Sta.). (*Jour. Dairy Sci., 21 (1938), No. 3, pp. 109–119, fig. 1*).—Fresh condensed skim milk and lots of the condensed product which had been held in storage at 0° F. for periods of from 1 to 9 mo. were used in this study. No change occurred in the appearance of the frozen product during storage, bu

after melting down samples frozen for 3 mo. appeared coarser than the fresh samples, while after 4 months' freezing a partial gel had been formed and beyond 5 months' storage the milk had formed a complete gel. Samples stored 8 mo. or longer showed considerable wheying off when thawed. The pH and titratable acidity of ice cream mixes prepared from the frozen product did not differ significantly from those using fresh condensed skim milk. Mixes from the frozen product had somewhat poorer whipping quality, and at a constant percentage of gelatin the ice cream from such mixes melted approximately twice as fast as those employing the fresh product. The frozen product when removed from storage could be shipped satisfactorily for a considerable distance at comparatively high temperatures with no additional refrigeration.

Oxidized flavors in strawberry ice cream, E. W. Bird, O. E. Ross, C. A. Iverson, O. R. Ause, and J. J. Willingham (*Iowa Sta. Res. Bul. 230 (1938), pp. 289–320, figs. 2*).—An investigation of factors that might cause oxidized flavors in strawberry ice cream indicated that oxidases from the fruit were not responsible and that the fruit did not contribute in causing this defect. The samples showed significantly less tendency to develop oxidized flavor the higher the iron content of the sample. Total copper content of the ice cream was a poor index of tendency toward oxidized flavor development, but the form in which the copper existed appeared to be of vital importance. Various fat constants showed little correlation with the rate of oxidized flavor development, although trends in the iodine number indicated that possibly oxidation of the fat was involved in the development of this defect. A comparison of ice creams in which dried skim milk and condensed whole and skim milks prepared in copper pans and in stainless steel pans were used as sources of serum solids showed that those containing condensed skim milk (copper pans) contained the most copper and were most susceptible to oxidized flavors, followed in order by those containing condensed whole milk (copper pans), commercial dried skim milk, condensed skim milk (stainless steel pans), and condensed whole milk (stainless steel pans). No oxidized flavor developed in either of the latter two classes of samples.

VETERINARY MEDICINE

[Contributions on animal pathology and bacteriology] (*Jour. Compar. Path. and Ther., 50 (1937), No. 4, pp. 282–350, 356–430, 436–446, figs. 13*).—Among the contributions made to this Festschrift to Sir John M'Fadyean in the December number are some passages from his writings bearing on clinical veterinary practice (pp. 287–290), the significance of veterinary pathology (p. 292), and tuberculosis (p. 350); "Rheumatic Disease" in the Horse (Osteo-arthritis and Allied Conditions), by W. M. Mitchell (pp. 282–286); A Short History of Veterinary Pathology, by E. Leclainche (p. 291); The Melanomata, by S. Hadwen (pp. 293–298); "Russell Bodies," or Hyaline Droplet Degeneration of Plasma Cells in the Portal Canals of the Sheep's Liver, by N. H. Hole (pp. 299–302); The Influence of the Veterinary Profession on Empire Development, by U. F. Richardson (pp. 303–306); Poison Plants in Australia, by H. R. Seddon (pp. 307–311); Pathology and Therapeutics of Nagana: An Appeal, by H. E. Hornby (pp. 312, 313); Drugs of Value in the Treatment and Control of Liver-Rot of Sheep, by R. F. Montgomerie (pp. 314–316); Does Jaagsiekte Occur in Great Britain? by E. L. Taylor (pp. 317–320); A Short History of Veterinary Bacteriology, by E. Leclainche (pp. 321–324); Veterinary Bacteriological Problems in South Africa, by E. M. Robinson (pp. 325–329); Investigations in Australia Into Some of the Problems of Infections by Anaerobic Micro-organ-

isms in Stock, by L. B. Bull and A. W. Turner (pp. 330–334); A Short Review of Successful Progress in Eradication of Contagious Bovine Abortion in Palestine, by S. J. Gilbert (pp. 335–337); *Abortus* Fever: Some Notes From Southern Rhodesia—Treatment of a Human Case with Prosepticine, by L. E. W. Bevan (pp. 338–344); The Susceptibility of the Wild Rat to Infection With *Brucella abortus*—A Preliminary Note, by T. J. Bosworth (pp. 345–349); A Short Survey of Sir John M'Fadyean's Contributions to the Study of Tuberculosis, by R. E. Glover (pp. 356–376); The Pathogenesis of Tuberculosis in Calves, by S. J. Edwards (pp. 377–382); A Brief Note on Tuberculosis in Tropical Africa, With Special Reference to Uganda, by J. Carmichael (pp. 383–385); Bovine Tuberculosis and Its Control, by J. M'Fadyean (pp. 386–392); Sir John M'Fadyean's Work on "Louping-Ill," by W. A. Pool (pp. 393, 394); Lamb Diseases Coincident With Louping-Ill, by W. L. Stewart and A. P. Ponsford (pp. 395–400); Pox in Pheasants, by N. Dobson (pp. 401–404); Rinderpest: A Résumé of Recent Progress in East Africa, by R. Daubney (pp. 405–409); Foot-and-Mouth Disease: A Prefatory Note (pp. 410, 411); The Demonstration of a Change in the Antigenic Structure of a Bovine Strain of Foot-and-Mouth Disease Virus During Serial Transmission in the Guinea-Pig, by A. Eccles, E. O. Longley, and J. K. Thomson (pp. 412–420); Foot-and-Mouth Disease in Hibernating Hedgehogs, by E. C. Hulse and J. T. Edwards (pp. 421–430); Sir John M'Fadyean's Contributions (pp. 436–443); and Some Further Excerpts (pp. 444–446).

[Work in animal pathology by the Storrs Station] (*[Connecticut] Storrs Sta. Bul. 221 (1937), pp. 15–31*).—The work of the year (E. S. R., 77, p. 537) includes that with infectious abortion in cattle, including establishment and maintenance of abortion-free herds by periodic blood testing and complete segregation of nonreacting animals and disposal of reactors; infectious mastitis in cattle, including the determination of the characteristics of streptococci of bovine origin (see page 391); a comparative study of methods for detecting evidence of mastitis and carriers of mastitis-producing organisms; development of a system of control through segregation of infected animals (E. S. R., 79, p. 246); determination of the characteristics of staphylococci of bovine origin and the relation of staphylococci to mastitis (E. S. R., 79, p. 108); paralysis in poultry; paratyphoid infection in animals; sheep diseases of economic importance in the State (E. S. R., 77, p. 697); and a survey of animal diseases that occur in the State based on laboratory diagnosis. The causes of mortality in high-producing flocks and records of bird and mammal diseases occurring in the State based on laboratory diagnosis during the year are reported in table form.

[Work in animal pathology by the New Jersey Stations] (*New Jersey Stas. Rpt. 1937, pp. 49, 50, 97–99*).—The work of the year (E. S. R., 77, p. 545) reported upon includes control of Bang's disease in cattle; diagnosis of poultry diseases occurring in New Jersey, including unusual cases of poisoning due to wood ashes and a rat poison, generalized tuberculosis and gizzard worms (*Acuaria anthuris*) in a crow, cecal coccidiosis (presumably a new species) in a chukar partridge reared in captivity, fowl pox in a chipping sparrow, a fluke which inhabited the upper respiratory tract of mallard ducks from Gloucester County, *Epomidiostomum uncinatum* in ducks, *Profilicollis botulus* in the intestines of wild ducks, *Lynchia fusca* in a great-horned owl, and the high incidence of fowl pox in nonvaccinated flocks; investigations of infectious laryngotracheitis (E. S. R., 77, p. 704); a study of fowl paralysis; and paratyphoid infection of pigeons.

[Work in animal pathology and parasitology by the South Carolina Station] (*South Carolina Sta. Rpt. 1937, pp. 63, 73, 85, 86*).—The work of the year includes a study of kidney worm infestation in swine, by G. W. Anderson

and L. V. Starkey, and a comparison of methods for its control, by E. D. Kyzer, T. M. Clyburn, and Anderson, and a study of so-called fowl paralysis (neurolymphomatosis gallinarum), by Anderson, R. C. Ringrose, and C. L. Morgan.

[Work in animal pathology by the Washington Station] (*Washington Sta. Bul. 354 (1937), pp. 23, 24, 60, 61*).—The work of the year reported upon relates to dysentery of calves, by H. G. McDonald and H. A. Smith, and factors responsible for the development and spread of mastitis in dairy herds, the efficiency of disinfectants, and lamb dysentery, all by E. C. McCulloch.

Morphogenetic and toxic activity of monovalent and trivalent thallium compounds, N. A. Iljin, P. Hofman, N. N. Melnikov, and A. M. Avetisian (*Arch. Internatl. Pharmacodyn. et Thér., 58 (1938), No. 4, pp. 371–403, figs. 3*).—This contribution is presented with a list of 34 references to the literature cited.

The pathogenicity to animals of viruses isolated from cases of human influenza, J. McIntosh and F. R. Selbie (*Brit. Jour. Expt. Path., 18 (1937), No. 4, pp. 334–344, figs. 5*).—Two strains of virus that were isolated by the authors from the lungs of cases of human influenza were found to be capable of causing an experimental disease with lung lesions in animals. "The lesions were produced in ferrets, mice, rabbits, guinea pigs, and a monkey by intranasal inoculation under anesthesia. Preliminary immunological tests show definite protection by convalescent influenza serums and by the anti-influenza serum 1 H, prepared by Smith, Andrewes, and Laidlaw [E. S. R., 71, p. 695] against their influenza virus."

Use of sulfanilamide in the treatment of type XIV pneumococcus infections in mice, L. H. Schmidt (*Soc. Expt. Biol. and Med. Proc., 37 (1937), No. 1, pp. 205, 206, fig. 1*).—The results reported have shown sulfanilamide to be an effective therapeutic agent for the treatment of type XIV pneumococcus infections in mice.

Treatment of pneumococcal infections in rabbits with sulfanilamide, W. A. Kreidler (*Soc. Expt. Biol. and Med. Proc., 37 (1937), No. 1, pp. 146–149, fig. 1*).—In the work reported, sulfanilamide when administered orally to rabbits in adequate doses early in the course of experimental dermal pneumococcal infection was found to eliminate this micro-organism from the blood stream, reduce the fever, cure the local lesion, and favor recovery in most of the animals.

The classification of staphylococci by precipitation and biological reactions, S. T. Cowan (*Jour. Path. and Bact., 46 (1938), No. 1, pp. 31–45*).—The biological reactions of human, animal, and all strains of staphylococci, the classification and biological characters of 146 strains of staphylococci, maximum precipitation between various antigens and 4 antiserums, etc., are reported upon in 8 tables.

Biochemical and serological characteristics of streptococci of bovine origin, W. N. Plastridge and S. E. Hartsell. ([Conn.] Storrs Expt. Sta.). (*Jour. Infect. Diseases, 61 (1937), No. 1, pp. 110–121*).—A detailed account is given of work previously noted (E. S. R., 77, p. 396). In this work "weakly hemolytic streptococci obtained from freshly drawn milk samples were divided into the following three general groups, on the basis of biochemical tests and the relation of the cultures to evidence of mastitis: (1) Streptococci possessing the biochemical characteristics of *S[treptococcus] agalactiae*, (2) mannitol fermenting streptococci associated with evidence of mastitis, and (3) streptococci regarded as saprophytes. These three groups are serologically distinct."

Precipitin tests revealed that all of the examined cultures which possessed the biochemical characters of *S. agalactiae* and which were obtained from animals with histories of permanent infection were serologically identical with Lancefield's group B. "A limited number of cultures was observed which re-

sembled *S. agalactiae*, but differed serologically by producing infection, with or without evidence of mastitis, of relatively short duration. The *S. agalactiae*-like cultures were tentatively designated as *S. pseudo-agalactiae*. Five strongly hemolytic or beta cultures obtained from milk were identified by biochemical and serological tests as follows: One associated with an outbreak of septic sore throat as group A, one from an acute case of mastitis as *S. agalactiae* (Lancefield's group B type III), and two from pooled herd samples and one from an acute case of mastitis as group C."

Infection of mice with Brucella abortus of bovine origin, N. J. SCORGIE (*Jour. Path. and Bact.*, *46* (*1938*), *No. 1*, *pp. 165–171*).—The suggestion by several authors that mice might be used to advantage, particularly where large numbers of animals are required in experimental work, led to the study here reported. It was found that, as compared with guinea pigs, relatively large doses of two strains of *B. abortus* were required to infect mice.

The cost of controlling contagious abortion in a large self-contained herd, A. D. McEWEN (*Jour. Min. Agr.* [*Gt. Brit.*], *45* (*1938*), *No. 1*, *pp. 28–37*).—In experiments conducted by the veterinary department of the South-Eastern Agricultural College, Wye, Kent, over a period of 6 yr. infectious abortion was effectively controlled in a large dairy herd of 180 or more cows.

Studies in anaplasmosis, R. R. DYKSTRA, H. F. LIENHARDT, C. A. PYLE, and H. FARLEY. (Coop. Kans. State Col. and U. S. D. A.). (*Kansas Sta. Rpt. 1* (*1938*), *pp. 32*).—Following a brief review of the literature in connection with a four-page list of references, a discussion of age incidence, and a description of experimental procedure, the results of inoculation studies in 10 projects are reported. The findings are summarized by the authors as follows:

"Iron, manganese, and copper build up the hemoglobin content of the blood, but do not increase the animal's resistance to anaplasmosis. The blood of 'carrier' or recovered animals retains the ability to transmit the disease as rapidly as blood taken from acute cases of anaplasmosis. Carrier or recovered animals have been resistant to infection. Flies (tabanids, etc.) do not attack animals when the flies are put in relatively darkened enclosures with the cattle. Calves inoculated with infective blood seem to acquire a resistance to anaplasmosis and become carriers. Many infected animals appear to recover completely after a period of 6 mo. (approximately), except for the continuance of cell inclusions, and the carrier state. The inoculation of ground lice taken from an animal sick with anaplasmosis did not reproduce the disease in a susceptible animal. Out of 12 experimental cases of anaplasmosis, there were but 2 deaths or 16⅔ percent mortality. These animals received no medication of any sort. This seems to clearly indicate that care, water, feed and protection from flies and sun are big factors in minimizing losses from this disease.

"Formalin in a concentration of 0.1 to 0.5 percent added to virulent citrate blood destroyed the infectivity of the blood. Such blood, however, failed to immunize cows. Sheep retained and transmitted infection after 6 mo. 'Urotropine' is not an effective agent in the treatment of anaplasmosis.

"'Laked' blood, acidulated with hydrochloric acid (0.75 percent), was kept at room temperature for 8 hr. and then refrigerated for 24 hr. and neutralized. Refrigeration was continued for an additional week and injected into cattle. This blood was innocuous and possessed no immunologic value. Laked blood refrigerated for 14 days, lost its infectivity, and when used in immunity experiments failed to immunize. Defibrinated, phenolized carrier blood (and defibrinated, phenolized blood from hyperimmunized carrier animals failed to immunize cattle.

"Thymus extract, heated and unheated, had no protective value. Rabbits, guinea pigs, white mice, white rats, field mice, wild gray rats, dogs, cats, sheep, goats, chickens, and ferrets have proved refractory to infection. Intradermal tests using (1) candle-filtered spleen extracts from acute cases, (2) chicken serum from chicken inoculated with spleen from an acute case, (3) candle-filtered extracts from carrier spleens, [and] (4) rabbit serum from rabbit inoculated with spleen from an acute case of anaplasmosis all proved valueless as diagnostic agents, either in acute cases or in carrier animals.

"The intravenous injection of hydrochloric acid (1–1,000) was of no value in reducing the virulence of the blood of carrier animals. Sheep retain and transmit infection at end of 6 mo. Urotropine is not an effective agent against the *Anaplasma marginale*. Atabrin and plasmochine failed to demonstrate any efficiency in relieving the carrier state or in the treatment of acute cases. Cattle treated with 2 percent mercurochrome within the third day after the initial temperature rise showed a prompt response and a recovery. Mercurochrome established a purging action that seemed to be entirely desirable. The carrier state has not been altered following treatment and recovery after the use of mercurochrome; such animals still remain carriers. Fuadin was not of therapeutic value in the treatment of one acute case of anaplasmosis."

Anaplasmosis transmission by naturally infected Dermacentor andersoni male and female ticks, C. E. SANBORN, G. W. STILES, JR., and L. H. MOE. (Okla. Expt. Sta. and U. S. D. A.). (*North Amer. Vet., 19 (1938), No. 1, pp. 31–33*).—Experimental work conducted cooperatively has shown that both the male and the female *D. andersoni* may transmit anaplasmosis in cattle, and that it is transmitted by naturally infected ticks.

Age as a factor in susceptibility to Johne's disease, W. A. HAGAN (*Cornell Vet., 28 (1938), No. 1, pp. 34–40*).—The data here presented show that young calves are most susceptible to Johne's disease, and that natural infections usually occur very early in life.

Infectious bovine mastitis.—VI, A laboratory procedure for the detection of bovine mastitis, W. N. PLASTRIDGE, E. O. ANDERSON, and J. S. SEBEMET (*[Connecticut] Storrs Sta. Bul. 224 (1938), pp. 12*).—A study of the practicability of employing Edwards' medium (E. S. R., 71, p. 99), composed of meat extract (Lemco) agar pH 7.4 (1,000 cc), crystal violet (B. D. H.) 0.1 percent (2 cc), defibrinated ox blood (50 cc), and Aesculin (1 g), to reduce the time required in the routine cultural examination of milk for mastitis is reported in continuation of work previously noted (E. S. R., 79, p. 246). The results obtained in observations of the behavior of 209 known cultures of streptococci of bovine origin on this medium are summarized as follows:

"All of 92 cultures of *Str[eptococcus] agalactiae* produced characteristic gray-blue colonies which were usually surrounded by a narrow zone of hemolysis; 19 cultures, 12 of which were known as *S. pseudo-agalactiae* and 7 as group [saprophyte] S_1 (Storrs), produced either gray-blue colonies resembling those of *S. agalactiae* or brown colonies resembling those of cultures regarded as saprophytes; all of 45 cultures of the *S. uberis* type, and all of 53 cultures regarded as saprophytes, produced brown colonies and browning of the medium.

"Edwards' medium was used in the examination of 525 incubated milk samples which contained streptococci, as shown by microscopic examination. Identification of isolations obtained from colonies on Edwards' medium showed that 95.7 percent of gray-blue hemolytic colonies and 94.9 percent of gray-blue nonhemolytic colonies were *S. agalactiae*. In comparison, only 4.1 percent of the colonies classed as brown were identified as *S. agalactiae*. It appears

that Edwards' medium is about 95 percent effective in separating *S. agalactiae* from other types of streptococci found in freshly drawn milk. The ability of the medium to inhibit the growth of staphylococci aided materially in detecting *S. agalactiae* when present in incubated samples that contained large numbers of staphylococci.

"A routine procedure for the laboratory detection of bovine mastitis and a plan for the interpretation and use of the results in segregating animals into different groups, as a mastitis control measure, are described."

Detection of mastitis by the brom-thymol-blue test, leucocyte count, and the microscopic examination of incubated samples of milk, A. C. Fay, H. W. Cave, and F. W. Atkeson. (Kans. Expt. Sta.). (*Cornell Vet.*, 28 (1938), No. 1, pp. 40–50).—A report is made of the progress of work involving nearly 7,000 comparative tests of animals segregated in the dairy barn of the station into three principal groups, namely, (1) animals regarded as free from mastitis, (2) animals regarded as suspicious for mastitis because of a high leucocyte count (500,000 or more per cubic centimeter) in the milk from one or more quarters, and (3) cows regarded as positive for mastitis because of the presence in the milk of long-chained streptococci, and usually, though not necessarily, a high leucocyte count.

It was found that "the bromothymol blue test detected only 21.1 percent of the samples taken from quarters infected with mastitis. Of samples taken from cows diagnosed as free from mastitis, the bromothymol blue test gave false readings in only 1.6 percent of the cases. If a bromothymol blue test is positive, there is a 92.7 percent chance that the cow will be found positive for mastitis on further examination. If a bromothymol blue test is negative, there is a 55.2 percent chance that the cow is actually negative, and hence a 44.8 percent chance that the negative test is false. The value of the bromothymol blue test may be summated by the statement that, although it rarely gives a false reaction with a known negative cow, it fails to detect a sufficiently high percentage of the positive cases to recommend it as a sole means of identification of mastitis for segregation purposes.

"The fact that high leucocyte counts above the arbitrary standard of 500,000 per cubic centimeter were found in only 36.7 percent of the samples actually containing long-chained streptococci suggests that this standard may be too high for proper interpretation. Long-chained streptococci were not detected in 14.7 percent of samples taken only from involved quarters of [cows in the third class], thus emphasizing the necessity of making repeated analyses for effective diagnoses. Leucocyte counts above 100,000 per cubic centimeter and the appearance of streptococci in chains of only medium length were frequently found to give forewarning of impending mastitis. Mastitis was found in this herd in 13 percent of heifers in their first lactation period, 38 percent of cows in their second lactation period, and increasingly high percentages in the groups in later lactation periods."

Once an animal has been justifiably moved from the first class down to the second or third class, there is little likelihood that it will be advisable to reclassify her again in the first class. Experience with this herd has shown that with few exceptions, such reclassifications have been based on false hopes.

Bovine mastitis.—III, A comparison of the bacteriological and physiological reactions of normal and mastitis milk from young cows, R. B. Little (*Cornell Vet.*, 28 (1938), No. 1, pp. 23–33).—In this third contribution (E. S. R. 78, p. 398) the results of daily laboratory examinations of the foremilk from 31 quarters of 8 young cows before and after infection with streptococci are reported. The results of 1,010 daily examinations before infection show that most of the determinations were within the limits generally accepted fo

normality. After the production of a subclinical mastitis, 2,163 examinations of the foremilk indicate that the plating of the foremilk in blood agar and the direct leucocyte count are more efficient in the detection of infection than either the H-ion or the chlorine test.

The incidence of the various serological types of Str. agalactiae in herds of cows in Great Britain, A. W. Stableforth (*Jour. Path. and Bact., 46 (1938), No. 1, pp. 21–29*).—Observations were made on the serological types of *Streptococcus agalactiae* (E. S. R., 78, p. 697) isolated from 1,546 infected quarters of 782 cows in 52 herds. In nearly all quarters and in most cows only one subtype was found. "Of the pure infections in cows, about 10 percent were due to type 2, the remainder being almost equally distributed between type 1 (usually 1a) and type 3 (usually 3a). Four percent of the cows carried unknown types. In 38 out of 45 herds 70 percent or more of the individual infections were alike, and in 15 all were alike. Of these 38 herds 23 were infected with type 1, 3 with type 2, and 12 with type 3. In herds with a low or average incidence the infecting type was nearly always type 1 (usually 1a). In over half of the remainder it was type 3.

"Details are given of the hemolytic activity of the strains and of the relation of hemolysis to serological type. It is shown that the use of serological methods has greatly simplified the routine diagnosis of *S. agalactiae*. The significance of the facts reported is discussed in relation to the contagiousness of infection with *S. agalactiae*."

External and internal metazoan parasites of Philippine cattle, Z. de Jesus (*Philippine Jour. Anim. Indus., 5 (1938), No. 1, pp. 21–34*).—An annotated list of metazoan parasites of cattle and zebus in the Philippines, systematically arranged, is presented and a table given showing the relative percentage of infestation with such parasites in mature ranch cattle. A list is given of 29 references to the literature.

Serological evidence for the occurrence of infection with human influenza virus in swine, R. E. Shope (*Jour. Expt. Med., 67 (1938), No. 5, pp. 739–748*).—In the course of investigations, the details of which are presented in two full-page tables (E. S. R., 78, p. 538), antibodies capable of neutralizing human influenza virus were found present in the serums of old swine on two New Jersey institution farms but absent from the serums of young swine on the same farms. "The old animals had lived through the winter of 1936–37 in which outbreaks of upper respiratory tract disease were prevalent among the human inmates of the two institutions, while the young swine studied were born long after these outbreaks. It is believed that the swine whose serums neutralized human influenza virus had undergone an unrecognized human influenza virus infection acquired from man. The possible bearing of these observations upon the theory that swine influenza was originally of human origin is discussed."

Generalized tuberculosis of swine due to avian tubercle bacilli, W. H. Feldman (*Jour. Amer. Vet. Med. Assoc., 92 (1938), No. 5, pp. 681–685*).—The tissues obtained at an abattoir in Minnesota from 30 head of swine that had extensive tuberculosis were examined by cultural methods and by guinea pig and rabbit inoculation to determine the type of the organism involved. In most instances lesions from tissues other than lymph nodes were examined. Avian tubercle bacilli were found to be the sole etiologic agent in 24 of 26 cases in which tubercle bacilli were demonstrated. In 2 cases bovine tubercle bacilli were obtained, and in 4 cases the results were negative for tubercle bacilli. In 28 of the cases the disease was sufficiently severe to justify the condemnation of the carcass, and in two instances the carcasses were passed for sterilization. The following conclusions are considered warranted: Although avian tuberculosis of swine is predominantly a localized disease of the lymph nodes, the

lesions may become distributed widely and may involve such organs as the liver, spleen, lungs, and kidneys. It is concluded that in districts where the incidence of localized tuberculosis of the lymph nodes of swine due to the avian tubercle bacillus is high, the same micro-organism is probably responsible for a considerable proportion of the cases of generalized tuberculosis in swine.

Centrifugation studies.—IV, The megatherium bacteriophage and the viruses of equine encephalo-myelitis and louping ill, F. F. Tang, W. J. Elford, and I. A. Galloway (*Brit. Jour. Expt. Path., 18 (1937), No. 4, pp 269–275*).—In further work (E. S. R., 78, p. 534) the rates of sedimentation of a megatherium bacteriophage and the viruses of equine encephalomyelitis and louping ill, when under the influence of centrifugal forces, were studied by the inverted capillary tube technic. The particle size values indicated for the respective active agents concerned were found to be in general agreement with the earlier values obtained by the method of ultrafiltration analysis.

Infectious equine encephalomyelitis and its biological treatment, E. Records (*Vet. Med., 33 (1938), No. 5, pp. 201–203*).—This summary of information is accompanied by a list of 12 references to the literature.

Studies on coccidiosis.—IX, Histopathology of the caecal type in the chicken, R. L. Mayhew. (La. Expt. Sta.). (*Amer. Micros. Soc. Trans., 56 (1937), No. 4, pp. 431–446, figs. 14*).—The observations here reported are said to have grown out of the experiments that have been conducted by the author on coccidiosis in the chicken (E. S. R., 72, p. 536). A description is given of the normal histology of the cecum of the chicken. A report is made of the histological changes leading up to hemorrhage and the steps in the development of the organisms are traced.

"In cases of severe hemorrhage the tissues of the epithelial layer, the tunica propria, and submucosa are so disorganized that they are indistinguishable in sections, and blood escapes freely into the lumen. As the bird recovers from the disease the epithelium of the glands and the tunica propria differentiate but the epithelium is more or less lacking between the glands on the surface of the lumen of the cecum, depending upon the severity of hemorrhage. In cases of slight hemorrhage the epithelium and a limited area of mucosa are ruptured, allowing blood to escape into the lumen of the cecum. This condition is restored to normal as the bird recovers from the disease.

"These results are in agreement with the experimental results reported in the previous papers of this series, namely, that severely affected birds have their weights permanently retarded, their egg production decreased, and the age of sexual maturity retarded, while the slightly affected individuals do not differ essentially from the controls in these respects. Individual cases representing unusual results of the disease are described, namely, enlarged and retained cores, stricture, lateral pockets, and adhesions.

"Secondary infection is rare in chickens under experimental conditions of management, due to their high natural resistance. However, this more often occurs, no doubt, under the usual conditions of management.

"The histopathological conditions observed may be the cause of the permanent effects of the disease on severely affected recovered birds in permitting the abnormal absorption of toxic substances from the cecal contents. If this be true, a successful economical treatment will probably be difficult to find."

A list is given of 14 references to the literature cited.

Studies on an uncomplicated coryza of the domestic fowl.—IX, The cooperative action of Hemophilus gallinarum and the coccobacilliform bodies in the coryza of rapid onset and long duration, J. B. Nelson (*Jour. Expt. Med., 67 (1938), No. 6, pp. 847–855*).—In further studies (E. S. R., 76, p. 396) of coryza of the domestic fowl coccobacilliform bodies were regularly

demonstrable, in addition to *H. gallinarum*, in exudate from birds infected with a passage strain of the coryza of rapid onset and long duration (type III). "Both agents were present throughout the entire course of the disease. The characteristics of type III coryza were reproduced by injecting a mixture of the two agents. The behavior of each component was altered by the association, indicative of a synergistic relation. Evidence that the coccobacilliform bodies might occasionally develop in birds infected with *H. gallinarum* following transfer by indirect contact was also obtained. The combined action of the two infective agents adequately accounts for the etiology of this particular strain of type III coryza."

Studies on fowl paralysis.—III, A condition resembling osteopetrosis (marble bone) in the common fowl, E. JUNGHERR and W. LANDAUER ([*Connecticut*] *Storrs Sta. Bul. 222 (1938), pp. 34, pls. 8*).—In continuation of the work on fowl paralysis (E. S. R., 78, p. 109), the study made of a spontaneous endemic outbreak of an avian hypertrophic osteopathy which occurred in a noncommercial plant of about 2,000 birds maintained for genetic research and which resembles the experimental disease in certain respects is reported. A review of the literature, first presented, is accompanied by a list of 98 references.

The incidence of grossly recognizable cases ranged from 0.1 to 2 percent in comparison with an incidence of 0.05 percent in 10,000 routine autopsy specimens examined. It is pointed out that similar sporadic hypertrophic osteopathies of the fowl have been reported from other parts of the world under the terms "akropachia ossea," "hyperplastic ostitis," "ostéopathie hypertrophiante pneumique," "diffuse osteoperiostitis," "osteitis deformans," and "osteodystrophia fibrosa." The last-mentioned condition has been produced also experimentally in birds, in France on a mineral-poor diet, and in Germany by the injection of normal embryonic or adult irradiated bone marrow.

"The spontaneous disease affected birds of both sexes and various breeds, usually after the age of 4 to 6 weeks, and brought about severe diaphyseal thickening and hardening primarily of the leg and wing bones, with the exception of the phalanges. In the beginning of the process affected bones were hyperpyretic. X-ray examinations have not been carried out in sufficient number to warrant a statement at this time.

"Pathologically the skeletal lesions varied in extent and development; they were characterized by diffuse thickening of the spongiosa and corticalis, accompanied by hypercalcification and narrowing of the medullary cavity."

A detailed description of histopathological findings, accompanied by numerous photographic illustrations, is included.

Since this condition resembles the corresponding human disease in the pathognomonic disturbance of endochondral ossification and in the association with leukemoid affections, the authors suggest the term "osteopetrosis gallinarum."

In etiological studies no evidence could be obtained for a bacterial, nutritional, or genetic basis of the condition. Inoculation of 61 baby chicks, in the course of four passages, with tissues from florid cases resulted in the production of 6 gross lesion cases of osteopetrosis, 6 gross lesion cases of osteopetrosis associated with lymphomatosis, and 23 cases of lymphomatosis. In transmissibility and certain histologic features, the spontaneous disease resembled experimental osteodystrophia fibrosa cystica produced in Germany. The transmissible agent of osteopetrosis seemed to be present in blood, bone marrow, and lymphomata, to withstand desiccation up to 105 days, and to be nondissociable from the agent of lymphomatosis. It appears that certain trains of lymphomatosis are endowed with an active or latent potentiality for neoplastic osteogenesis.

Although not of immediate economic importance, avian osteopetrosis is said to deserve interest as an integral part of the transmissible tumor complex in the common fowl, and perhaps as offering an experimental approach to the pathogenetic and etiologic study of the corresponding osteopathy in man.

Fowl pest: The susceptibility of monkeys, hedgehogs, and other animals, G. M. Findlay and R. D. Mackenzie (*Brit. Jour. Expt. Path., 18 (1937), No. 3, pp. 258–264*).—Rhesus monkeys were found to be susceptible by intracerebral inoculation to certain strains of the fowl pest virus. When inoculated intraperitoneally or intranasally they do not show any reaction, but subsequently develop immune bodies. Hedgehogs are susceptible to the virus of fowl pest when injected intracerebrally. Ducks are also susceptible on intracerebral but not on intramuscular injection. Pigeons may develop nervous symptoms after intraperitoneal and intracerebral inoculation, but die only when virus is inoculated by the latter route.

The histopathology of fowl pest, G. M. Findlay, R. D. Mackenzie, and R. O Stern (*Jour. Path. and Bact., 45 (1937), No. 3, pp. 589–596, pls. 3, figs. 8*).—The histopathology of fowl pest is described with special reference to the changes produced in rhesus monkeys, ferrets, hedgehogs, pigeons, and ducks. The virus has been found capable of causing lesions in tissues derived from all three embryonic layers. "Apart from meningoencephalomyelitis, changes are found in the liver, lungs, spleen, lymph nodes, kidneys, and alimentary canal. Many of the lesions are similar to those caused by the viruses of yellow fever and Rift Valley fever. Characteristic intranuclear inclusions are found in the central nervous system of all susceptible species and in the livers of the ferret, hedgehog, pigeon, duck, hen, and canary."

A study of the behavior of fowl pox virus modified by intracerebral passage, G. J. Buddingh (*Jour. Expt. Med., 67 (1938), No. 6, pp. 933–940, pls. 2*).—Intracerebral transfer in chicks of fowl pox virus was found to produce marked changes in its behavior when studied in the chorioallantoic membrane of chick embryos and in the skin of baby chicks.

A meningo-encephalitis in chicks produced by the intracerebral injection of fowl pox virus, G. J. Buddingh (*Jour. Expt. Med., 67 (1938), No. 6, pp. 921–932, pls. 2, fig. 1*).—Report is made of a meningoencephalitis resulting from intracerebral inoculations of young chicks with fowl pox virus.

Pullorum disease, C. B. Hudson (*New Jersey Stas. Hints to Poultrymen, 25 (1937), No. 1, pp. 4*).—A brief practical account of this disease and means for its control.

Studies on duck septicemia, R. Graham, C. A. Brandly, and G. L. Dunlap. (Ill. Expt. Sta.). (*Cornell Vet., 28 (1938), No. 1, pp. 1–8, figs. 3*).—A highly fatal disease met with on a commercial duck farm in Illinois that was reproduced in healthy ducks by inoculation of tissue suspensions from affected ducks, as well as with freshly isolated cultures of the *Pfeifferella anatipestifer*-like organism. "The gross lesions in the artificially induced disease were typical of the natural disease, and the *P. anatipestifer*-like organism was recovered in pure culture. Mildly affected ducks which had recovered proved measurably refractory to natural and artificial exposure, while subcutaneous inoculation of chemically killed cultures (0.5 percent formalin) appeared to provide an appreciable degree of protection in healthy ducks against lethal amounts of the virulent culture."

An outbreak of fowl typhoid in guineas, F. R. Beaudette. (N. J. Expt. Stas.). (*Jour. Amer. Vet. Med. Assoc., 92 (1938), No. 5, pp. 695–698*).—The author reports upon an outbreak of typhoid in guinea fowl on a farm in Essex County, in which 100 day-old guineas placed in a house with 12 ducks

of the same age began to die in the course of 2 weeks, 91 guineas and 1 duck succumbing. Post-mortem and bacteriological findings reported upon led to the determination of fowl typhoid as the cause. A review of the literature briefly considered in connection with a list of 13 references has failed to reveal a similar outbreak in guinea fowl. The known mortality of 92 percent in less than 3 weeks is considered unique for this disease in any species.

[The use of anthelmintics for the control of avian parasites], R. M. SMITH and W. L. BLEECKER (*Arkansas Sta. Bul. 351 (1938), pp. 39, 40*).—The work of the year (E. S. R., 76, p. 696) is briefly noted.

AGRICULTURAL ENGINEERING

[Agricultural engineering investigations by the Arkansas Station], D. G. CARTER, R. M. SMITH, W. C. HULBURT, and O. J. HALL (*Arkansas Sta. Bul. 351 (1938), pp. 10, 11, 40*).—The progress results are briefly presented of investigations on the influence of electric lighting and insulated houses on egg production, farm-building designs for Arkansas, water resources for rice irrigation, and use of tractor power on plantations.

[Agricultural engineering investigations by the New Jersey Stations] (*New Jersey Stas. Rpt. 1937, pp. 28, 29*).—The progress results are briefly reported of investigations on poultry housing and sweetpotato storage.

Water and sewage research [by the New Jersey Stations] (*New Jersey Stas. Rpt. 1937, pp. 113–116*).—Progress results are briefly reported of investigations on activated sludge, chemical coagulation, garbage in sewage, pathogenic organisms in sewage and activated sludge, treatment of industrial waste, and effect of trade waste on sludge digestion.

Stages and flood discharges of the Connecticut River at Hartford, Connecticut, H. B. KINNISON, L. F. CONOVER, and B. L. BIGWOOD (*U. S. Geol. Survey, Water-Supply Paper 836–A (1938), pp. II+18, pl. 1, figs. 2*).—This report relates particularly to the flood of 1936, but gives comparative information regarding previous floods covering a period of nearly 300 yr.

Watercycle lysimeters for watershed studies, H. S. RIESBOL and G. L. SHERMAN. (U. S. D. A. and Ohio Expt. Sta.). (*Agr. Engin., 19 (1938), No. 3, pp. 123–128, figs. 8*).—Lysimeters adapted to the detailed analysis of the hydrologic cycle in its relation to watershed studies are described and illustrated. These are in use on the north Appalachian experimental watershed of the Soil Conservation Service.

The rate of infiltration of water in irrigation practice, M. R. LEWIS. (Idaho and Oreg. Expt. Stas. and U. S. D. A.) (*Amer. Geophys. Union Trans., 18 (1937), pt. 2, pp. 361–368, figs. 8*).—The data reported in this paper were secured in the course of irrigation and drainage investigations conducted during 1926 and 1927 by the Idaho Experiment Station and since 1932 by the Oregon Station.

Tests of the rate of infiltration of irrigation water on several different soils and locations in Idaho and Oregon are reported in which small cylinders 18 in. in diameter were used. This equipment was found to give reliable results. Depths infiltrated ranged from 0.48 to 20 in. at the end of 1 hr. and from 0.53 to 80 in. at the end of 5 hr. The more rapid infiltration at the beginning of an irrigation should be considered in the design of irrigation field layouts.

Irrigation of field crops on the Great Plains, L. BOWEN. (U. S. D. A.). (*Agr. Engin., 19 (1938), No. 1, pp. 13–16, fig. 1*).—The results of field experiments with sugar beets, alfalfa, potatoes, and oats, conducted cooperatively by the Bureaus of Agricultural Engineering and Plant Industry, are reported. The

experiments relate to the use of water by field crops under irrigation and the efficiency of irrigation practices.

The conclusion is drawn that water requirement for oats would be reasonably representative for the small grains, and water requirement for late potatoes, except for time of use, would be about the same as for the early variety. In general, such crops as early potatoes and small grains require water early in the season, the period from May to the middle of July, while sugar beets and late potatoes require most of their water during the latter part of the season—July to September. Alfalfa, pastures, and other perennials do best if water in liberal amounts is supplied throughout the entire growing season. Thus in the selection of the crop to be grown due consideration should be given to the water supply and its availability during the season.

Direct graphic solution of terrace outlet channel dimensions, V. W. Thalmann. (U. S. D. A.). (*Agr. Engin., 19 (1938), No. 2, pp. 55, 56, 58, figs. 3*).—A graphic method is described for the direct solution of outlet channel cross sections.

Power, fuel, and time requirements of contour farming, E. L. Barger. (Kans. Expt. Sta. and U. S. D. A.). (*Agr. Engin., 19 (1938), No. 4, pp. 153–157, figs. 5*).—Implements used in the tests included a two-bottom plow, three-bottom plow, tandem disk harrow, duckfoot field cultivator, wheatland disk plow, and damming lister. Five tractors were used, three of them in drawing the implements and two in drawing the combined outfit of tractor and implement in draft tests.

An average of all tests in which up, down, and contour travel was in the same gear (either second or third) shows a time advantage for the contour of 1.8 percent and a fuel saving on the contour of 6.4 percent. Those tests in which up travel was in one gear lower than down and contour travel show an average time saving of 20.4 percent and fuel saving of 11.7 percent in favor of the contour. Time and fuel savings average 12.8 and 9.4 percent, respectively, in favor of the contour operation. A comparison of the average of all uphill and downhill draft tests with an average of all contour draft tests showed that they were practically identical. There was a difference of 0.1 percent with the combined tractor and implement units and 1.4 percent with the implements only. This comparison was made at a 3 m. p. h. speed in all cases. Therefore, it may be said that the average of the draft uphill and downhill will be equal to the draft on the contour at a given speed. On the average, the downhill draft of the combined units was about 25 percent less than the contour draft, and the uphill draft was about 25 percent greater than the contour draft. These are also based on a 3-m. p. h. speed. The implement draft up the slope and down the slope varied by about 10 percent above and below the contour draft.

From a power standpoint, because of a higher average speed of travel the power requirement was greater on the contour plats than on the uphill and downhill plats. This is to be expected if the average of uphill and downhill draft is equal to contour draft at a given speed. The increase in implement draft due to a speed increase and the effect of the increased speed on power both tend to increase the contour power requirement.

In general in normal field operation the combination of the efficiencies of the uphill and downhill work will be less than for contour operation. This will be the case invariably if the average horsepower on the uphill and downhill travel is equal to or less than the horsepower on the contour.

A plow that builds contour furrows, X. McNeal. (Mo. Expt. Sta.). (*Agr. Engin., 19 (1938), No. 2, pp. 57, 58, figs. 3*).—A contour furrowing machine is described which was developed to meet the requirements of minimum disturb-

ance of sod, ridge construction capable of impounding rain water, reversible action, and light draft. This machine consists essentially of an 18-in. tractor sulky equipped with both a right-hand and a left-hand bottom to form a large lister. The upper parts of the frogs were cut away and the rear parts of the moldboards cut off. The curvature of the moldboards was also reduced considerably so as to lift the furrow slices more gently and avoid inverting them. Long, gently curved steel slats were fastened to the rear of the moldboards to hold the sod up, while a disk fastened immediately behind and under the moldboards moves soil from under the upper furrow slice and throws it beneath the lower furrow slice to form the ridge. The machine is made reversible by mounting the disk on a short beam which can be swung from side to side about a pivot point at the rear of the plow beams. On all tests the lister part of the machine was operated at 5 in. deep and with the disk cutting 6 in. deeper into the subsoil. The disk penetrated and operated quite satisfactorily even in hard dry subsoil. The machine has been operated on sod in various degrees of cover, ranging from excellent bluegrass to barren pastures. The best work was done on good bluegrass sod. In good sod the machine has consistently built ridges which have an effective height of 6 in. and which are 9 in. higher than the bottom of the furrow after the sod strip has fallen in. With a vertical interval of 0.6 ft., the furrows will impound the heaviest rain which may be expected once in 10 yr.

[Investigations at the Soil and Water Conservation Experiment Station], G. M. Horner and S. J. Mech. (Coop. U. S. D. A.). (*Washington Sta. Bul. 354 (1937), pp. 74–76*).—The progress results are briefly presented of investigations on effect of plant cover on run-off and erosion, movement and balance of soil moisture, tillage and cultivation practices for erosion control, cropping practices in relation to erosion control, terracing, and tree planting for erosion control.

Public Roads, [April and May 1938] (*U. S. Dept. Agr., Public Roads, 19 (1938), Nos. 2, pp. [2]+17–32+[2], figs. 12; 3, pp. [2]+33–52+[2], figs. 15*).—These numbers of this periodical contain data on the current status of various highway projects receiving Federal funds as of March 31 and April 30, 1938. No. 2 also contains an article entitled Rural and Urban Contributions to Highway Travel and Expenditures, by R. H. Paddock (pp. 17–30); No. 3, An Action Program to Advance Safety on the Highways, by T. H. MacDonald (pp. 33–36, 51), and An Automatic Recorder for Counting Highway Traffic, by R. E. Craig (pp. 37–51).

Directional permeability of seasoned woods to water and some factors which affect it, H. D. Erickson, H. Schmitz, and R. A. Gortner. (Minn. Expt. Sta.) (*Jour. Agr. Res. [U. S.], 56 (1938), No. 10, pp. 711–746, fig. 1*).—The directional permeabilities to water of 14 hardwoods and 2 softwoods were determined, using sections about 1.25 mm thick. In general, most of the sapwoods of species with resin canals were appreciably permeable radially at 10 cm of mercury, whereas nonresinous woods were not. The radial permeability of resinous sapwoods was much greater and more variable than that of nonresinous sapwoods. Usually, sapwood was more permeable radially than heartwood. In the sapwood, summerwood was nearly as permeable radially as springwood at 100 lb. per square inch. In heartwood, springwood was usually more permeable. Tangential permeability (at high pressure) of woods with resin canals was less than radial permeability; some heartwoods were impermeable. The tangential permeability of a nonresinous wood approximated the radial value for the same wood; the sapwood was often more permeable than the heartwood.

The experimental data plus the structural features of wood indicated that the observed radial flow through sapwoods with resin canals was chiefly through resin canals. In heartwood, resin canals or wood rays may have assisted flow in some woods. Wood rays probably were important paths of flow in certain woods. In general, the rate of flow decreased with increasing time of continuous flow and approached equilibrium. Several factors are given which may account for irregularities of flow. The ratio of the permeabilities (calculated to a standard basis) of some woods in the three structural directions are given. Longitudinal permeability was usually thousands of times greater than lateral permeability.

Some kinematic and dynamic studies of rigid transport wheels for agricultural equipment, E. C. McKibben (*Iowa Sta. Res. Bul. 231 (1938), pp. 321–390, figs. 43*).—Field and laboratory studies relating to the consideration of rigid right-cylindrical transport wheels with the purpose of elucidating the motion and force relations of the soil upon which they operate are reported.

Equations were developed for the relative effect of speed, diameter, and effective obstruction height on impact. The mechanics of a wheel rolling on a nonelastic friable medium was developed and the fact of slippage established both rationally and experimentally. The nature of the soil motions and soil displacements caused by a rigid wheel was studied. It was found that the soil adjacent to the track left by a rigid wheel is moved ahead and that this change in position of soil particles is attained by curved rather than straight line motion.

The effect of area upon the supporting capacity per unit area was studied for four conditions. A wide variation was found for this relationship. Apparently this variation was caused by differences in the cohesion and internal friction of the soils.

An apparatus for studying the rolling resistance and slippage of individual transport wheels was designed and built. With this apparatus the possibility of using variable load trials was studied. The results obtained by the use of this method were unreliable. The effect of speed was investigated for two conditions, meadow and tilled soil. For these soil conditions and speeds up to 5 miles per hour, the effect of speed appeared to be of minor importance compared to the effects of diameter and width. The effect of repeated trials in the same track was investigated, and the rolling resistance was found to vary approximately as the −0.2 power of the number of the trial for trials on meadow and as the −0.5 power on tilled soil.

The effects of load (300 to 1,200 lb.), diameter (16 to 60 in.), and width (2.5 to 20 in.) on rolling resistance and slippage were investigated for three surfaces—meadow, tilled soil, and a layer of dry, loose sand on concrete. The rolling resistance was found to vary approximately as the 0.6 to 1.3 power of the load, the −0.5 to −0.7 power of the diameter, and the −0.5 to 0.5 power of the width. These variations are explained qualitatively by certain combinations of wheel dimensions and soil conditions.

The association of soil moisture, volume weight, and resistance to penetration with rolling resistance was studied. A very high positive correlation, 0.97, was obtained between penetration readings of the "penetrometer" used in these studies and rolling resistance, and a high negative correlation, −0.87, was obtained between volume weight and rolling resistance.

The general conclusion is drawn that the impact resulting when a rigid wheel strikes a solid obstruction is (1) proportional to the square of the speed S, (2) increased by increasing the effective height h of the obstruction or by decreasing the radius r of the wheel, (3) a function of the ratio R of

the wheel radius r to the effective height of the obstruction h, (4) a function of the angle θ between the vertical radius, O to Q, and the radius, O to P, striking the obstruction, (5) proportional to the product of the secant and the square of the tangent of the angle θ, (6) approximately proportional to the square of the tangent of θ for small values of the angle θ and the corresponding large values of the ratio R, and (7) of the same order as the impact which would result by falling from a height, H, where

$$H=\frac{0.0334\ S^2R\ (2R-1)}{(R-1)^3}=0.0334\ S^2\tan^2\theta\sec\theta.$$

The mechanics which have been developed for the rolling of a rigid wheel on an elastic surface cannot be applied to such a wheel when rolled on a nonelastic friable medium. During one revolution a rigid wheel rolling on a nonelastic friable medium will travel a distance greater than the length of its circumference. The rolling of a rigid transport wheel causes a permanent soil displacement parallel to the direction of its travel. The change in position of soil particles caused by the passage of a rigid transport wheel is attained by curved rather than straight line motion. One-hundred-ft. variable load trials are unreliable for the study of the effect of load upon the rolling resistance of rigid transport wheels because of the time lag between the application of a given load and the attainment of equilibrium penetration with its corresponding rolling resistance.

For the range of areas tried (approximately 3 to 12 sq. in.) increasing the supporting area increases the supporting capacity per unit for cohesionless soils and decreases it for soils with cohesion. For soils of intermediate characteristics there is some evidence that this relationship passes through a minimum with the lowest supporting value per unit area occurring at some intermediate area.

It is concluded further that the factors contributing to rolling resistance are (1) friction in the axle bearing, (2) forward, lateral, and downward displacement of the soil, (3) friction between the soil and the face and edges of the rim, (4) adhesion of soil to the wheel, and (5) impact of wheel upon surface irregularities.

Within the range of usual operating conditions the effect of changes in wheel load, diameter, and width can usually be approximated by a simple exponential equation of the form $Y=KX^c$, where Y is the rolling resistance, X is the load, diameter, or width, K is a constant depending upon the soil and wheel conditions and the units of measurement used, and c is a constant depending upon soil and wheel conditions but independent of the units of measurement. For this investigation the values of c were of the order of 0.6 to 1.3 for the effects of load, —0.5 to —0.7 for the effects of diameter, and —0.5 to 0.5 for the effects of width.

Rating tractor tires for performance, J. W. SHIELDS (*Agr. Engin., 19 (1938), No. 1, pp. 26, 33, fig. 1*).—Graphic data are presented for the selection of pneumatic tractor tires on the basis of the requirements of performance.

Home-made farm equipment, W. P. KINTZLEY (*Colorado Sta. Bul. 443 (1938), pp. 20, figs. 20*).—This bulletin gives practical information on the construction of a motor-driven hay buck, a low platform wagon, a hayrack, fence brace, harrow platform, gate latch, and gate rest.

Performance characteristics of 5- and 6-foot combines, W. M. HURST and W. R. HUMPHRIES. (Coop. Ill., Ind., Ohio, and Miss. Expt. Stas.). (*U. S. Dept. Agr. Circ. 470 (1938), pp. 36, figs. 13*).—Tests on 5- and 6-ft. combines conducted by the Bureau of Agricultural Engineering in three Middle Western and two central Southern States in both small grains and soybeans are reported.

The different makes of small combines upon which tests were made were similar in that pneumatic tires were used, and the threshing and cleaning capacity is larger per foot of cutter-bar width than in other machines, making possible a higher ground speed. In small grain the 5- and 6-ft. combines were usually pulled from 0.5 to 1 mile per hour faster than the larger sizes in soybeans an average of 0.5 mile faster. Several machines of the smaller sizes operated at speeds in excess of 5 miles per hour under favorable conditions in both small grain and soybeans. In general there was no relation between size of machine and grain losses within the scope of the experiments. It was found that in combining wheat in favorable seasons cutter-bar losses for small combines were approximately the same as for the larger ones in harvesting, and the smaller machines were superior to them in threshing. In unfavorable seasons the harvesting loss with small combines was higher and the threshing loss lower than with the larger machines. Cutter-bar losses for the small machines operating in wheat constituted 66 percent of total machine losses and in oats 21 percent of the total machine losses. Cutter-bar losses for the 8-ft. and larger machines operating in wheat constituted 51 percent of the total machine losses and in oats 25 percent of total machine losses. Comparatively high threshing losses in oats emphasize the importance of careful machine adjustment when threshing lightweight crops.

With soybeans in Illinois in 1935 total losses with the small and large machines were practically the same; in 1936 a lower cutter-bar loss for the larger machines resulted in a difference of over 4 percent in favor of the large machines. In the Mississippi Delta, where soybeans are planted in rows, the machines in 1936 were practically as efficient as those operating in Illinois, where soybeans are drilled or broadcast. A swath 95 percent of the total cutter-bar width was taken by the small machines in harvesting small grain, while with the larger machines the swath ranged from 91 to 94 percent of the total width. In soybeans in Illinois the effective cutting width was 97 percent of the cutter-bar length for the small machine and 94 percent for the 8-ft. or larger sizes, while in the Mississippi Delta the average was 100 and 96 percent, respectively. Complete quality analysis of small grain samples in Illinois, 1936, indicated no effect on quality resulting from differences in size of machines. In Ohio, 1936, with 4 of 13 samples of wheat obtained from 5- and 6-ft combines foreign material was a grading factor; with the larger machines test weight alone accounted for the discounts. Grade analysis of soybeans in Illinois in 1935 favored the larger machines and in Mississippi the smaller. Different concave arrangements doubtless accounted for the difference in grades.

Fertilizer placement experiment with cotton, N. McKaig, Jr., and A. B. Bowen (*South Carolina Sta. Rpt. 1937, pp. 138–140*).—Progress results are reported of experiments on (1) the effects of side placement of different fertilizers by a commercial shovel-type distributor and the combination planter and disk-type distributor developed by the U. S. D. A. Bureau of Agricultural Engineering, (2) side dressing v. application of all the nitrogen in the fertilizer at or previous to planting, and (3) the effects on the soil and the crop of acid-forming and neutralized fertilizers of the same plant food content.

Care and repair of cotton-gin brushes, V. L. Stedronsky and A. J. Johnson (*U. S. Dept. Agr. Circ. 467 (1938), pp. 14, figs. 9*).—Evidence is presented that worn-out or damaged gin brushes cause inefficient ginning and damage to the lint. Extensive ginning tests with brushes in good and in worn condi-

tion showed differences in ginning capacity with damp cotton of 10 percent for staple length of 1⅛ in. and longer and 7 percent for shorter staple length. The differences between the good and worn brushes were less with dry cottons because dry fibers are easier to remove from the saws than damp fibers. Because of loss of some of the undoffed lint with the seed and inefficient ginning, lint turn-out was lower with the poor brushes than with the good brushes.

Loss in monetary value of the lint removed with poor brushes increased with moisture content of the seed cotton and with staple length, amounting to 67 ct. per bale with long-staple damp cotton ginned with seed rolls of equal density. When effort was made to maintain with the poor brush a ginning capacity equal to that with the good brush, grade damage occurred in addition to losses of lint, and with the damp cottons bale-value losses amounted to $1.50 for the longer and 80 ct. for the shorter staple. Practical information is given on brush repair.

Research in air conditioning for the milling industry done at Kansas State College, C. O. Swanson. (Kans. Expt. Sta.). (*Northwest. Miller, 193 (1938), No. 1, pp. 44, 46, 49, 51, 52*).—Experiments in air conditioning, conducted as a supplement to work in wheat tempering, are described.

[Grain storage investigations by the Maryland Station], R. W. Carpenter (Coop. U. S. D. A.). (*Maryland Sta. Rpt. 1937, pp. XVII, XVIII*).—The progress results are briefly presented of studies on grain storage on the farm.

Measuring stacks of chopped alfalfa hay, R. F. Johnson (*Idaho Sta. Circ. 78 (1938), pp. 4, fig. 1*).—These brief investigations indicate that in stacks chopped third-cutting alfalfa is less bulky than the second cutting. A slight difference exists between third and first cuttings. The volume of chopped alfalfa hay is approximately one-third of the volume of long alfalfa hay in stacks. Under average conditions, when stacks of chopped alfalfa hay are not segregated according to cuttings, 150 cu. ft. per ton is a practical figure to use for computing the tonnage of stacks of chopped alfalfa hay measured according to the farmers' rule.

[Hay curing investigations by the Storrs Station] ([*Connecticut*] *Storrs Sta. Bul. 221 (1937), pp. 31, 32*).—The progress results of initial trials to test the influence of spontaneous heat generation in connection with forced air draft in curing hay and exploratory trials with heating coils on the principle of direct transference of heat through the stationary hay mass are noted.

AGRICULTURAL ECONOMICS

[Investigations in agricultural economics by the Arkansas Station, 1936–37] (*Arkansas Sta. Bul. 351 (1938), pp. 81–89*).—Results of investigations not previously noted are reported on as follows: Findings (1) by C. O. Brannen as to delinquency on property taxes in 1936 as compared with 1935 and 1933, receipts from taxes levied for the State government in 1935–36 as compared with the two previous fiscal years, and farm returns and taxes on farms 1930–36, inclusive; (2) by K. H. Hunter and H. W. Blalock on sources, amount, and cost of long- and short-term farm credit in the upland and delta sections of the State; (3) by W. T. Wilson on size of farms, crop yields, labor income, etc., in 1935 on 386 farms in 3 upland counties of the State; (4) by O. J. Hall on land utilization in different type-of-farming areas in the State; (5) by Wilson on prices of farm products in Arkansas in 1936 as compared with earlier years;

(6) by Hall and W. C. Hulburt on use of tractors for different operations on 5 delta cotton farms and the time required for different operations; (7) by Hall on equipment, sales, commissions charged, etc., of livestock auctions in the State during the year ended June 30, 1936; and (8) by Hall and T. W. Douglas on capacity of warehouses and elevators, storage charges, shipments, etc., for rice.

[Investigations in agricultural economics by the New Jersey Stations, 1936–37] (*New Jersey Stas. Rpt. 1937, pp. 23–28*).—Included are some brief findings as to the average production per acre and prices of apples, 1926–35; and the changes from 1924 to 1934 in size of farms and dairy herds, milk production per cow, volume of milk sold, prices received, acreage in crops, labor income, and value of real estate for 24 farms in Burlington County.

Current Farm Economics, [April 1938] (*Oklahoma Sta., Cur. Farm Econ., 11 (1938), No. 2, pp. 25–48, figs. 4*).—The usual tables of index numbers of prices in the United States and Oklahoma and demand deposits in Oklahoma and of price and purchasing power of Oklahoma farm products are brought down through March 1938. Articles are included on The Agricultural Situation, by T. R. Hedges (pp. 26, 27); Land Tenure and Agricultural Conservation, by P. Nelson (pp. 27–33); Seventeen Years of Cooperative Cotton Marketing, by W. W. Fetrow (pp. 34–39); Some Human Problems in Land Use Planning, by O. D. Duncan (pp. 39–43); and Livestock Numbers in Oklahoma From 1924 to 1938, by A. L. Larson (pp. 44–46).

[Investigations in agricultural economics by the South Carolina Station, 1936–37] (*South Carolina Sta. Rpt. 1937, pp. 9–11, 13, 14, 17, 18, 78, figs. 2*).—Results of studies not previously noted are reported as follows: (1) Table, by G. H. Aull and E. Riley, showing the average net incomes of and taxes paid by persons in different occupations grouped in three groups on the basis of the ratio of income to taxes paid, as shown by over 100,000 income returns for 1929, 1930, 1932, 1934, and 1935, and text discussing the proportion of net income required for taxes on interest and dividends, surtaxes, etc.; (2) map, by Aull and Riley, showing by counties the percentages of taxes on farm real estate becoming delinquent, and text discussing the size of delinquencies and the shift since 1930 in the type of properties delinquent; (3) findings, by H. A. White, as to the increase of staple length of cotton, 1928–36; and (4) table, by C. S. Patrick, showing man hours and cost per acre of harvesting oats with horse-drawn and tractor-drawn binders and stationary separators and with a combine with auxiliary motor.

Part-time farming in the United States, W. B. Jenkins and H. E. Robison (*Washington: U. S. Bur. of the Census, 1935, pp. 205, figs. 42*).—This special study includes tables and maps based on the 1935 farm census and 1930 census. The term "part-time farmer" is used to designate "those operators of farms who spent one or more days off their farms at work for pay or income during the calendar year immediately preceding the census date." One chapter (pp. 7–87) includes maps and tables showing by States and counties the numbers of farm operators, total and by color and tenure and by principal occupations, working off their farms for different numbers of days for pay or income. Another chapter (pp. 88–95) deals with the nonagricultural pursuits of the rural-farm male population, and includes tables showing for 1930 by States and geographic divisions the number and percentages of the rural-farm male population 10 yr. old and over engaged in gainful occupations by specified industry groups. A third chapter (pp. 96–199) contrasts the organization of part-time and other

farms in areas of one county or several contiguous counties in 14 States representing a rather broad distribution from an industry and a geographic standpoint.

Effects of better selection of crops and pastures on farm income in Missouri, G. W. COLLIER and O. R. JOHNSON. (Coop. U. S. D. A.). (*Missouri Sta. Res. Bul. 282 (1938), pp 62, figs. 5*).—It is deemed necessary to consider production over a period of from 5 to 10 yr., together with a consideration of improved or impaired soil resources in correctly evaluating alternative farm organizations. Cropping systems are suggested for certain soils and improved farm practices are indicated.

[Basic data for land classification of Kootenai and Minidoka Counties, Idaho]. (Coop. U. S. D. A. et al.). (*Idaho Sta. Mimeogr. Ser. 2, 1937, pp. [1]+22, figs. 7; pp. [2]+22, figs. 7*).—These mimeographed pamphlets are typical of the series being prepared by the station. Tables and maps present data as to crop and animal production; types, uses, ownership, assessed value, etc., of lands; tax delinquency; wheat yields; etc. The pamphlet giving basic data for land classification of Kootenai County is by P. A. Eke and C. O. Youngstrom; that of Minidoka County is by Eke, A. Joss, J. L. Hood, and H. M. Pugmire.

Studies in the economic geography of Puerto Rico, R. PICÓ (*Puerto Rico Univ. Bul., Ser. 8, No. 1 (1937), pp. 84, figs. 10*).—Included are papers on geographical and economic factors influencing Puerto Rican agriculture, its agricultural problems, and the geographic regions of Puerto Rico.

Recent changes in tax rates on farm real estate in North Carolina, G. W. FORSTER. (Coop. U. S. D. A.). (*North Carolina Sta., AE-RS Inform. Ser. No. 3 (1937), pp. IV+53, figs. 8*).—This study is based on data obtained chiefly from 213 farms in 20 counties from 1913 to 1919 and from 423 farms in 31 counties in 1920 to 820 farms in 52 counties in 1935. Tables and charts present data by years and by counties, showing the size of farm; average assessed value per acre; acreage, production, and value of crops; indexes of tax rates and net farm income; tax rates per acre, etc. The stability of the tax rates, causes for changes, etc., and three proposals for reducing variations—stabilization of incomes, budgeting, and borrowing and repayments—are discussed.

Farm real estate taxes per acre in the State increased from 10 ct. in 1913 to 20 ct. in 1919 and 64 ct. in 1928, then decreased to 48 ct. in 1932 and to 33 ct. in 1935. The index of taxes increased from 100 in 1913 to 674 in 1928 and then decreased to 346 in 1935. Changes in tax rates from one year to the next were pronounced in practically all counties. Assessed valuations were quite uniform, with a marked decline after 1932.

Some legal and administrative features of rural real estate tax delinquency in Ohio, H. R. MOORE (*Ohio State Univ., Dept. Rural Econ. Mimeogr. Bul. 105 (1937), pp. [1]+8*).—This paper is devoted chiefly to a discussion of the difficulties associated with the tax delinquency laws of Ohio and the administration of such laws.

Report of the education committee of the Minnesota State Planning Board on school district organization (*[St. Paul]: Minn. State Planning Bd., 1937, pp. 31, pls. 9*).—This report is based on data gathered in a survey of 14 counties. The conditions existing as to school district organization, school population, teaching personnel, transportation of pupils, and financing, including tax valuations, rates and delinquency, expenditures, and indebtedness, are analyzed. Proposed plans for reorganization in Pope County on a county unit

8:4 or 6:3:3 basis of pupil distribution are compared with the present district system. A reorganization plan for the 14 counties is discussed.

It is estimated that the reorganization in Pope County on an 8:4 county basis would reduce the amount to be raised by local taxes from approximately $93,600 to $85,100. On the 6:3:3 basis the approximate amount of local taxes would be $81,000. For the other 13 counties it was estimated that reorganization would result in the average tax rates on agricultural lands being reduced 1 mill in 4 counties and less than 1 mill in 7 counties, and increased 2 and 3 mills, respectively, in the other 2 counties. In all counties the rates on nonagricultural land would be reduced, the average decrease being 12 mills.

A graphic summary of farm crops (based largely on the Census of 1930 and 1935), O. E. Baker and A. B. Genung (*U. S. Dept. Agr., Misc. Pub. 267 (1938), pp. II+129, figs. 220*).—This publication, which brings up to date information previously noted (E. S. R., 66, p. 477), deals not only with changes between 1930 and 1935 but also with those during the decade of urban prosperity and agricultural depression that preceded the more general depression. Included are maps based on the estimates of the Department of Agriculture covering farm crops; cotton, tobacco, and flax; cereals; hay; annual legumes and sugar; potatoes, sweetpotatoes, and vegetables; and fruits and nuts.

World wheat survey and outlook [September 1937 and January and May 1938], H. C. Farnsworth and H. Working (*Wheat Studies, Food Res. Inst. [Stanford Univ.], 14 (1937), No. 1, pp. [2]+36, figs. 9; 14 (1938), Nos. 5, pp. [2]+183–221, figs. 11; 8, pp. [2]+319–358, figs. 8*).—These three numbers continue the series previously noted (E. S. R., 78, p. 875).

The importance of the fruit and vegetable industry in Louisiana, R. A. Ballinger (*Louisiana Sta. Bul. 294 (1938), pp. 45, figs. 13*).—Tables and charts are included and discussed in regard to production, farm prices and values, etc., of different vegetables and fruits in the United States and Louisiana; the exports from and imports into the United States of certain fruits and vegetables; and shipments from Louisiana, etc., during the period 1919–36.

The production of fruits and vegetables in Louisiana has been increasing in amount at a rather steady rate since 1919 and somewhat more rapidly than for the entire country. Most of the increase has been in sweetpotatoes, potatoes, strawberries, and oranges. The first three of these account for about 80 percent of the total value of all fruits and vegetables produced in the State. There was little or no consistent tendency for the production of most of the minor crops to increase. The North Central States provide the most important markets for Louisiana fruits and vegetables. A somewhat larger percentage of strawberries than of other products is sent to markets in the northeastern part of the country, while markets in the western regions receive a relatively greater proportion of the State's sweetpotatoes.

The farm prices of fruits and vegetables grown in Louisiana declined almost continuously from 1925 to 1932, but the decline in their purchasing power was not as great as the decline in price. The increase in purchasing power since 1932 has not been as great as the increase in price. Since the amounts of Louisiana fruits and vegetables that were produced increased during the time prices were declining, although not as rapidly as prices declined, the farm values of these products declined less from 1925 to 1932 than did farm prices. The purchasing power of these farm values increased from 1919 to 1926, and has remained about stationary, except for some minor year to year fluctuations, since then.

An economic study of peach farms in the Sandhill area of North Carolina, G. W. Forster and R. E. L. Greene (*North Carolina Sta., AE–RS Inform. Ser. No. 2 (1937), pp. III+50, figs. 13*).—This bulletin is based on data obtained in surveys of the business of from 34 to 48 farms during the years 1927–29, 1931, and 1933, a total of 212 farms. The soil, climate, markets, use of land, etc., in the area, and the competition between North Carolina and other States in the peach enterprise are described. An analysis is made of capital requirements, size of commercial peach farms, returns, expenses, etc., on the farms studied, and the factors affecting income.

The average capital requirement for the 5 yr. was $17,567, of which 89 percent was in land, buildings, and fences. The average acreage in peaches varied from 65.2 to 90 in the different years. The total receipts averaged $6,178, of which 86.1 percent was from peaches. The total expenses averaged $7,313. The average labor incomes and the percentages of returns on capital were $5,293 and 20.6, −$2,321 and −13.3, −$1,456 and −11.4, −$2,741 and −19.4, and $556 and 1.4, respectively, in the different years. The farms with the largest acreage in peaches had the highest incomes in good years and the lowest incomes in poor years. On farms with less than 20 acres in peaches the returns on capital were seldom greater than $1,000 or the losses more than $1,000. Farms with less than 100 acres in peaches seldom had returns on capital greater than $3,000. Supplementing crops tended to increase the income in good peach years and to reduce the decrease in years when peach prices were declining.

Economic studies of poultry farming in New York.—I, Commercial poultry farms, 1926, 1929, 1930, 1931, 1932, 1933, E. G. Misner and A. T. M. Lee. (Coop. U. S. D. A.). (*[New York] Cornell Sta. Bul. 684 (1937), pp. 118, figs. 32*).—"This bulletin gives a business analysis of the poultry enterprise on New York farms where poultry is the major enterprise." The study is based on from 99 to 153 records for the years ended September 30, 1926, and 1929–33, inclusive, obtained from 670 up-State and 83 Long Island commercial poultry farms with flocks of 500 or more hens. No records were taken in northern New York, and 359 came from farms selling chicks. Tables are included and discussed analyzing the prices for chickens, eggs, poultry feed, etc., amount and use of capital, sources of income, farm expenses, labor income, relative returns on dairy and poultry farms, size of flocks, egg production, and costs and returns in producing eggs, rearing pullets, and hatching and raising chicks. Factors affecting the cost of producing eggs and labor income are also analyzed and discussed for the period 1929–33, inclusive. Of the 600 records included in this analysis, 304 were from farms which sold chicks.

For the farms for which analysis was made of the factors affecting labor income and cost of producing eggs, the average labor income for the different years varied from $2,319 in 1929 to $515 in 1933, averaging $1,233. The cost of production of eggs per dozen varied from 40 ct. in 1929 to 25 ct. in 1933, averaging 32 ct., and the average value of eggs per dozen varied from 43 ct. in 1929 to 24 ct. in 1933, averaging 32 ct.

The effect of a combination of factors on labor income is discussed. A list of important business-analysis factors for commercial poultry farms and a farm-management-efficiency program for New York poultry farms are included.

The following table shows the effects of different factors on labor income and cost of producing eggs:

Changes in labor income and in cost of producing eggs accompanying changes in business factors, 5 years 1929–33

[No factors held constant [1]]

Factor	Amount of change in the factor		Accompanying increase in labor income		Accompanying change in cost of producing eggs per dozen	
	Increase	Decrease	Increase	Decrease	Increase	Decrease
			Dollars	*Dollars*	*Cents*	*Cents*
Cost of producing eggs per dozen		$0.01	50			
Capital per farm	$1,000		41		0.18	
Number of layers per farm	100		95		0	0
Dozens of eggs produced per farm	1,000		85			.24
Eggs per hen, year	12		176			1.52
Percentage lay, *October–December*, inclusive	1		51			.32
Value of eggs per $1 of feed cost	$0.10		148			.88
Percentage of the income from pullets and chicks sold	10		378		1.65	
Dozens of eggs produced per man	1,000		154			.80
Percentage of the receipts represented by *value of labor including operator*		1	82			.30
Gross income per man	$100		69			.043
Years required for receipts to equal capital		1	771			2.00
Percentage mortality of number of layers at beginning of year		1	17			.28

[1] *All changes based on 5-year simple averages of yearly 3-group differences.*

Trends in the dairy industry, R. W. Bartlett (*Ind. State Dairy Assoc. Ann. Rpt., 47 (1937), pp. 24–39, figs. 10*).—Tables and charts are included and discussed showing the effects of changes in consumer incomes upon the dairy industry, actual and probable changes in the population of the United States, effect of high market milk prices on the consumption of canned milk, relation of per capita consumption of milk and family incomes, why substitute foods are used, shifts of retail distribution from independent to chain stores, and shifts from wagon to store sales in Boston, Mass., and San Francisco, Los Angeles, and Fresno, Calif.

[**Quality of cotton in different States**]. (Coop. Expt. Stas. et al.). (*U. S. Dept. Agr., Bur. Agr. Econ., 1937, pp. [2]+59, figs. 4; pp. [2]+45, figs. 5; pp. [2]+68, figs. 6; pp. [2]+65, figs. 6; pp. [2]+32, figs. 6; 1938, pp. [2]+124, figs. 6*).—This series of mimeographed reports gives information by years 1928–36 (Arkansas and Missouri 1928–35) on quality, staple length, prices, etc., of cotton grown in the different areas of the States similar to that previously noted for Louisiana (E. S. R., 77, p. 120) and Mississippi and Texas (E. S. R., 77, p. 719). The Alabama report was prepared by W. B. Lanham, F. H. Harper, and N. B. Clyde-Burton; the Arkansas and Missouri report by Lanham, R. C. Soxman, and V. E. Gilliam; the Georgia report by Lanham, Harper, and G. E. Miller; the South Carolina report by Lanham and Harper; the Tennessee report by Lanham and Soxman; and the irrigated Southwest (Arizona, California, New Mexico, and District 1 of Texas) report by Lanham, Harper, and Miller.

Storage and transportation of Arkansas rice, O. J. Hall and T. W. Douglas (*Arkansas Sta. Bul. 355 (1938), pp. 40, figs. 8*).—This bulletin shows the physical facilities for transporting and storing rice; the location, storage capacity, and milling capacity of Arkansas mills; and the charges for storage

and transportation. Combined storage capacity of public warehouses, elevators, and mills on December 1, 1936, amounted to 4,300,000 bu., or 54.1 percent of production in the State. Storage capacity of mills amounted to 2,270,265 bu., warehouse capacity to 1,445,400 bu., and elevator capacity to 584,700 bu. Storage on the farm has become relatively less important than it was prior to 1925, when public storage facilities in Arkansas usually amounted to less than 10 percent of the production, but increased from 1925 to 1937 from 700,000 to 1,950,000 bu. The average investment for 10 warehouses was 9.6 ct. per bushel for storage capacity, as compared with 19.6 ct. for elevators. Individual ownership was the most common type of ownership of storage facilities.

The average cost of storage, including the charge of the warehouse and elevator and premium on fire and tornado insurance for the first month, was $1.85 per 100 bu. This increased to $2.92 for a 2-mo. period, with an additional charge of 93 ct. for the third month and 69 ct. for the fourth month.

Warehouses and elevators performed certain income-producing services incidental to rice storage, including cleaning rice and other grains; turning; weighing; loading; storing oats, soybeans, and other products as required; and selling on commission.

Shipments are made direct to purchasers. Rail transportation accounted for approximately 92 percent of the shipments of rough rice from warehouses and elevators in the north section of the rice area to mills, as compared with 42 percent for facilities south of the Arkansas River. Truck shipments of clean rice are largely confined to the territory within 500 miles of the mills and are important in movement of traffic to destinations in Arkansas, adjoining States, and to Central Western States. The advantage of the geographical position that Arkansas possesses is not fully realized under the present rate structure in reaching inland points north and northeast of the State. This causes discrimination to Arkansas shippers of clean rice with the net effect of movement being possible only with relatively low f. o. b. mill prices for the portion of the crop moving to markets where the rate from Louisiana and Texas is below that of Arkansas.

Agricultural marketing in India: Report on the marketing of wheat in India *(India [Agr. Market. Adv.], Market. Ser. No. 1 (1937), pp. [1]+XIV+451, pls. 23, figs. 25).*—This is the first of a series of marketing surveys recommended by the Royal Commission of Agriculture in India. The data are discussed under sections on supply; utilization and demand; wholesale prices; preparation for market; assembling; classification, grading, and standardization; conservation; handling and transportation; wholesale distribution; processing and distribution of wheat products; seed; and weights and measures and units of sale. Notes on governmental measures in other countries relating to wheat are also included.

Production and marketing of truck crops in the Territory of Hawaii, O. C. Magistad and T. O. Frazier *(Hawaii Sta. Bul. 78 (1938), pp. 46, figs. 8).*—This is a survey of production and marketing problems. It was found that 60 percent of the vegetables consumed were locally grown. Information is presented on acreage, production, crop estimates, grading, packing, and marketing.

Use of motortrucks in marketing fruits and vegetables, M. P. Rasmussen. (U. S. D. A. and 9 expt. stas.). *(Farm Credit Admin. [U. S.], Coop. Div., Bul. 18 (1937), pp. VIII+120, figs. 6).*—This bulletin analyzes the experiences of growers, cooperative associations, and others in nine States tributary to the New York market—Connecticut, Delaware, Maryland, Massachusetts, New Jersey, New York, North Carolina, Pennsylvania, and Virginia. Data concerning

sales of fruits and vegetables, costs of operation of motortrucks, and other items during the year ended June 30, 1934, were obtained from 3,681 growers in 53 intensive producing areas in the nine States, and from 267 growers patronizing New York City markets during 1933-34. Data as to methods of transportation used were also obtained from 134 private country shippers, 58 merchant truckers, and 56 farmers' cooperative associations, and regarding costs and factors affecting costs from 277 commercial motortruck operators. Sixteen leading wholesale commission firms in New York City also made their records available for analysis. The trends in the use of trucks; places of sales; sales agencies employed; kinds of transportation used by growers; use of trucks by growers, country dealers, shippers, and farmers' cooperative associations; volume of products trucked; relation of financing to marketing channels and methods of transportation used; effects of place of sale, type of buyer, and methods of transportation on net returns to growers; and the problems resulting from the use of motortrucks are discussed.

Wholesale markets for fruits and vegetables in 40 cities, W. C. Crow (*U. S. Dept. Agr. Circ. 463 (1938), pp. [2]+142, figs. 74*).—"The purpose of this report is to bring together certain statistical information and descriptive material concerning the wholesale fruit and vegetable markets of several of the principal cities of the United States, and to point out some of the general principles which need to be considered in any plan of improving these markets." The problems in the markets, market regulations, ways the markets can be improved, market organization in each of the 40 cities, and the trucking of fruits and vegetables within the cities are discussed.

Chain-store distribution of fruits and vegetables in the Northeastern States, A. C. Hoffman and L. A. Bevan. (Coop. N. J. Expt. Stas.). (*U. S. Dept. Agr., Bur. Agr. Econ., 1937, pp. [2]+48, figs. 4*).—The importance of chain stores in fruit and vegetable distribution, the place in the marketing structure—New York City, Philadelphia, and Boston—grower problems in dealing with chain systems, and the marketing efficiency of such systems are described and discussed.

Marketing timber for handle stock in Indiana, R. C. Brundage (*Indiana Sta. Bul. 424 (1937), pp. 36, figs. 24*).—Market requirements and specifications for different kinds of timber for different uses are described. An analysis is made of marketing methods, determination of stumpage values, costs of logging, transportation, etc.

Over 74 percent of Indiana woodland owners sell their timber for handle stock to buyers rather than direct to manufacturing companies, and only 7 percent of the handle stock is sold direct to the manufacturers. An analysis of 36 sales of white ash in northern Indiana showed a $3 greater net return per 1,000 bd.-ft. when timber was sold by log scale than when sold for a lump sum. Knowledge by farmers of the volume of standing timber, or ability to measure logs, was reflected in a greater stumpage return of from $2 to $9 per 1,000 bd.-ft.

An economic analysis of the charges for transporting milk to Connecticut markets (*[Connecticut] Storrs Sta. Bul. 221 (1937), pp. 3-5*).—Included are some findings based on records from 237 routes supplying milk dealers as to charges for transportation and the effects of length of route, volume handled, type of road, type of trucker, and other factors on charges.

Cooperative egg auctions, S. H. DeVault (*Maryland Sta. Rpt. 1937, pp. XIII, XIV*).—Some data are included as to surplus eggs produced and methods of marketing in the Eastern Shore, Piedmont Plateau, and Western Shore areas of the State.

Business analysis of the Utah Poultry Producers Cooperative Association, J. J. Scanlan. (U. S. D. A. and Utah Expt. Sta.). *(Farm Credit Admin. [U. S.], Coop. Div., Bul. 19 (1937), pp. VI+119, figs. 33).*—This report deals with the marketing phases of an economic study of the poultry industry undertaken in 1929. The association studied is the third largest farmers' cooperative in the United States in the volume of eggs handled, and is a service agency rather than strictly a marketing association. The organization features; operating setup; financing; membership; volume of sales; egg-, poultry-, and turkey-marketing operations; purchasing of feed and other supplies; other services; and the factors underlying the success of the association are described and discussed. The marketing contracts of the association are included.

District indexes of prices, quantities, and values of cash sales of Minnesota farm products, W. B. Garver and W. C. Waite *(Minnesota Sta. Bul. 335 (1937), pp. 23, figs. 7).*—The level of agricultural prices in Minnesota has varied materially during the last 12 yr. Using 1924–1925–1926 as the base, the index of prices declined from 105 in 1929 to a low of 41 in 1932 and subsequently rose to 78 in 1935. The index of gross cash sales follows the variation in the index of prices closely, since the total quantities of products sold do not appear to have varied greatly during the period, except for drought. The quantity index of crop sales was below 75 for the period from 1927 to 1935, while that for livestock sales increased considerably following 1930. The quantity index of livestock product sales increased throughout most of the period, reaching 124 by 1933, but declined to 106 for 1935, due to the drought. The index of crop prices was somewhat lower between 1926 and 1932 than the indexes of livestock prices and livestock product prices. In 1932, because of smaller marketings and lower prices, the income from crop sales was only about 22 percent of that in the base period. The income from livestock sales in the same year was 42 percent of that in the base period and for livestock products 55 percent.

Individual agricultural products had somewhat different price movements. The prices of crops fell earlier and further, and later rose more rapidly than the prices of livestock and livestock products. The variation in type of agriculture among districts of the State has been sufficient to result in considerable differences in the changes of income during the last 12 yr.

Index numbers of production, prices, and income, *J. I. Falconer (Ohio Sta. Bimo. Bul. 191 (1938), p. 68).*—The table of index numbers previously noted (E. S. R., 78, p. 864) is brought down through December 1937.

Crops and Markets, [April 1938] *(U. S. Dept. Agr., Crops and Markets, 15 (1938), No. 4, pp. 69–88, figs. 2).*—Included are seasonal reports on the important crops; index numbers of prices paid and received by farmers; crop and livestock production reports; and market reports of cotton, dairy and poultry products, feeds, seeds, grain, livestock, and livestock products.

Cooperative bookshelf *(U. S. Dept. Agr., Agr. Adjust. Admin., Consum. Counsel Ser., Pub. 3 (1937), pp. [6]+13).*—This is a bibliography of publications of the Federal Government on consumers' cooperation.

RURAL SOCIOLOGY

[Sociological studies by the Arkansas Station] *(Arkansas Sta. Bul. 351 (1938), pp. 47–50, 89, 90).*—Brief findings are included as to studies by I. C. Wilson and W. H. Metzler on sickness and medical care in an Ozark Plateau area; by Wilson on sickness and medical care among the Negro population in a delta area of Arkansas; and by Metzler on changes, 1930–35, in population and church and school attendance and budgets in Arkansas villages and towns.

[Investigations in rural sociology by the South Carolina Station, 1936–37] (*South Carolina Sta. Rpt. 1937, pp. 14–17, 19, 20, fig. 1*).—A table by B. O. Williams shows for 1,830 farmers in 8 counties the average number of years between moves for white and negro owners and tenants. A list of desirable features in leases is also given. Some findings by Williams and W. S. Crawford as to schooling, reasons for relief, and types of relief furnished 3,430 rural households from July through December 1935 are also included.

The Associated Country Women of the World: Proceedings of the Third Triennial Conference held at Washington, May 31–June 11, 1936 (*Washington: Govt., 1937, pp. VII+369, pls. 5*).—This conference has been discussed editorially (E. S. R., 75, p. 145).

Man-land adjustment: A study of family and inter-family aspects of land retirement in the Central Wisconsin Land Purchase Area, G. W. Hill, W. Slocum, and R. O. Hill (*Wisconsin Sta. Res. Bul. 134 (1938), pp. [2]+80, figs. 16*).—This study of family and interfamily aspects of land retirement was made mainly to determine the social problems involved in a land retirement and resettlement program. The Central Wisconsin Purchase Area, including parts of Juneau, Jackson, Monroe, and Wood Counties, and the Resettlement Area, which is contiguous to the first area and includes parts of Wood, Clark, Marathon, and Jackson Counties, are described. Analyses and comparisons are made of the characteristics, occupational adjustments and incomes, standards of living, and interfamily and town-country relationships in the two areas. The prospects for resettlement of families from the first area in the second area are discussed. The methodology used in the study is described.

Of the 147 families (40 percent of the total) studied in the Purchase Area, 58 appeared qualified for resettlement aid for full-time commercial farms, 18 for part-time subsistence farms, and 9 for retirement homesteads. Sixty-two families were not qualified for resettlement aid, 31 because of advanced age, 16 because of the fact that they were broken and single-member families, and 15 because they were nonfarm families. The following recommendations for future land purchase and resettlement projects are made: (1) A successful land purchase program must have a clear and constant purpose, and the families involved must be thoroughly familiar with its objectives; (2) careful consideration must be given to the human factor—family characteristics, occupational training, financial resources, etc.—before actual purchase is made; (3) a resettlement plan disregarding interfamily relations may easily encounter a handicap that will preclude successful adjustment of families with the land; (4) a superior land use program may justify the evacuation of an area by Government purchase in a short period, but in such a case the purchasing agency should have a definite program and a qualified staff to care for the welfare of all the families in the area; (5) where immediate evacuation of an area is not necessary, the families should be withdrawn over a period of time rather than abruptly; and (6) standards of living depend upon individual motivation and acceptance of the forms society seeks to impose, as well as upon the resources of the land.

Beltrami Island, Minnesota, R. W. Murchie and C. R. Wasson (*Minnesota Sta. Bul. 334 (1937), pp. 48, figs. 22*).—The Beltrami Island Resettlement Project in northern Minnesota was the first demonstration resettlement project to be gotten under way under the land retirement program of the Federal Government. Work began in 1934 but it was the end of 1936 before the bulk of the settlers were moved. The purchase area was a typical cut-over area with soils too poor to give an adequate income for agricultural uses. A nearby area of better soils was available for the resettlement of the families. The history

of the settlement of Beltrami Island, the conditions existing as to agriculture, income of settlers, schools, churches, communication facilities, county and school tax receipts and delinquency, public expenditures, etc., are described, and some of the results of the purchase and resettlement program are discussed. "The people have been placed on demonstrably better soil, their financial position has been definitely improved, and they can now obtain the public services which they could not afford previously. From the public standpoint, the financial condition of the county has improved, and the promised savings in costs to the public have materialized. It is, of course, too early to make a final judgment of the results."

Disadvantaged classes in American agriculture, C. C. TAYLOR, H. W. WHEELER, and E. L. KIRKPATRICK (*U. S. Dept. Agr., Farm Security Admin. and Bur. Agr. Econ., Social Res. Rpt., 8 (1938), pp. [4]+124, figs. 33*).—This is described as a "more or less impressionistic study of the 'sore spots' in American rural life . . . made to reveal in broad outline the major factors that tend to reduce approximately one-third of the farm population of the Nation to submarginal standards of living." These factors and the areas involved are described. It is stated in part that "there were in the United States in 1929 approximately 1,700,000 farms which yielded gross farm income of less than $600, based on value of products sold, traded, or used; a few more than 900,000 farms that yielded less than $400 income; and almost 400,000 farms that yielded less than $250. On these farms yielding less than $600 income approximately 7,700,000 men, women, and children lived, whose lives were disadvantaged because of the lack of purchasing power. . . . There are more than a half-million farms in the United States on land that is so poor that it will literally starve the families living on it if they continue to try to make a living by farming it. . . . During the depression at least 3½ million, or more than 1 out of every 4, rural families in the United States had received public assistance at some time."

The extent of dependency upon old age assistance in South Dakota, J. P. JOHANSEN (*South Dakota Sta. Bul. 318 (1938), pp. 47, figs. 12*).—This study includes all aged men and women who made application for old age assistance to the county welfare boards in South Dakota from the beginning of operation of the State old age assistance plan in October 1936 until February 1, 1937. Several facts point toward the conclusion that the level of old age dependency will rise considerably above the mark reached in January 1937, or at present, i. e., (1) the aged population as a whole is increasing rapidly in numbers, (2) those who now reach 65 or 70 are liable to have lost or depleted their resources because of untoward economic and financial conditions during the past decade, (3) there were above 15,000 needy aged and also there were large margins of pending cases both in the city and in the country, (4) the November data revealed a large proportion of new cases in addition to the reopened ones, (5) certain counties in which the number of recipients lagged behind in January now show large increases, (6) there is a marked tendency as the assistance program is developed for an increasing proportion of applicants to come from the age group from 65 to 70, (7) it is not likely that the burden of support of the aged will be assumed by legally responsible relatives, (8) comparison of South Dakota with surrounding States indicates that the rate of dependency is not abnormally high, and (9) a similar comparison suggests that the rate of dependency has not reached a stable level.

As the administration of old age assistance reaches a settled routine condition, deaths of recipients will become the principal though not the only reason for the closing of cases. Moreover, as the full volume of need at ad-

vanced age levels is met by this form of assistance, the new intake will come mainly from those who have just crossed the threshhold of 65.

Sickness and medical care in an Ozark area in Arkansas, I. C. Wilson and W. H. Metzler (*Arkansas Sta. Bul. 353 (1938), pp. 39, figs. 5*).—In this study schedules were obtained from 322 families in the Hindsville community, a typical Ozark area with a population of about 1,300 persons. These families were interviewed as to the state of their health, the cost and type of medical service utilized, and their indebtedness for medical care. The community had one resident doctor, no dentist, no hospital, and no nurses (only three nurses in the entire county and four practical nurses in the Hindsville trade area). Medical care was also hampered by poor communication and transportation facilities. The data indicated that 73 percent of the people were in good health, 10 percent in fair health, and 17 percent in poor health. The total cost of medical services in this area was $8,587.74, or an average of $26.67 per family. Fifty-two percent of the families utilized the services of a physician, 15 percent dental services, 12 percent practical nursing services, and 5 percent hospital services. Families with high incomes had better health than those with small incomes. People near a doctor used his services more than those farther away. The infant death rate in the area was abnormally high, one-fifth of all deaths during the past 5 yr. occurring during the first year of life. The median cost for funerals was $108

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Motion pictures of the United States Department of Agriculture, 193[illegible] (*U. S. Dept. Agr., Misc. Pub. 288 (1938), pp. III+24*).—A list of the educationa[l] films issued by the Department, with information indicating how the films ma[y] be obtained.

An extension program for range management and range livestock a[s] adopted at a regional extension conference held at Spokane, Wash., Ma[y] 24–27, 1937, W. A. Lloyd (*U. S. Dept. Agr. Circ. 468 (1938), pp. 11*).—Include[d] are the reports, with recommendations and programs, of the range livestock a[nd] range management—agronomy, forestry, and water conservation (irrigation)-committees and a table showing by States the projects adopted for immedia[te] emphasis.

Sources of information on consumer education and organization (*U. [S.] Dept. Agr., Agr. Adjust. Admin., Consum. Counsel Ser., Pub 1 (1936), pp. V[+] 33*).—The Federal Government agencies performing consumer services are list[ed] with a brief description of the nature of the services and a list of publi[ca]tions. A list is also included of some nonprofit, nongovernmental organizati[ons] and their publications.

Consumers' bookshelf (*U. S. Dept. Agr., Agr. Adjust. Admin., Consum. Co[un]sel Ser., Pub. 4 (1937), pp. VIII+100*).—The references in this bibliogra[phy] are chiefly on commodity buying. Some references are also included [on] budgeting; consumer credit; exhibit material; health; home planning, main[te]nance, and repair; standards, grades, and labels; and aids for teachers of c[on]sumer problems.

FOODS—HUMAN NUTRITION

The foundations of nutrition, M. S. Rose (*New York: Macmillan Co., 1[938,] 3. ed., pp. XI+625, [pls. 2], figs. 117*).—In this revision (E. S. R., 70, p. [...]) alterations and additions have been made throughout the text. The [...] change noted in the general plan of the contents is that vitamin E, which [was] discussed in a separate chapter in the previous editions, is presented, toge[ther]

with vitamin H (B_6) and pellagra, in a chapter entitled vitamins of undetermined significance in human nutrition. The table in the appendix giving the nutritive values of foods in shares, which was contained in 11 pages in the first edition, is extended to cover 56 pages.

Some present day problems in nutrition, E. N. Todhunter (*Jour. Amer. Dietet. Assoc., 13 (1937), No. 3, pp. 235–244*).—The author reviews some of the recent investigations of the nutritional habits of people living in the United States to illustrate the nutrition problems that need to be solved in order to carry out successfully the present program "to improve the health, resistance, and longevity of our people and thus promote the efficiency, happiness, and security of the race."

The little things in life, B. Sure (*New York and London: D. Appleton-Century Co., 1937, pp. XII+340*).—The relation of the vitamins, mineral elements, and ductless glands to the nutrition and health of man is discussed in nontechnical language. Much of the material is based on an earlier book by the author, The Vitamins in Health and Disease (E. S. R., 69, p. 897).

How to feed young children in the home, M. E. Sweeny and D. C. Buck (*Detroit: Merrill-Palmer School, 1937, pp. 68, figs. 8*).—This pamphlet, published under a grant from the Irradiated Evaporated Milk Institute, contains information to guide parents in the choice and methods of preparing food, together with food consumption tables and about 100 laboratory-tested recipes perfected and adapted for home use by the mothers of nursery school children.

[Studies in foods and nutrition from the Arkansas Station] (*Arkansas Sta. Bul. 351 (1938), pp. 46, 47*).—Progress reports (E. S. R., 76, p. 716) are given by Z. C. Battey on the formation of crystals in grape jellies, and by M. E. Smith on the diagnosis of vitamin C subnutrition in children by the analysis of blood and urine.

[Food analysis studies by the New Haven Station] (*Connecticut [New Haven] Sta. Bul. 409 (1938), pp. 278, 279*).—This progress report (E. S. R., 78, p. 562) summarizes the results of the routine analysis of samples of vitamin D milk and frankfurt sausages.

[Food consumption studies by the South Carolina Station] (*South Carolina Sta. Rpt. 1937, pp. 20–24*).—In this annual report summaries are given by A. M. Moser on the food consumption of farm families in the lower Coastal Plains and by M. E. Frayser on the production and consumption of dairy products in eight counties of South Carolina.

[Studies in foods and nutrition of the Washington Station] (*Washington Sta. Bul. 354 (1937), pp. 41–43*).—Included in this progress report (E. S. R., 77, p. 418) are summaries of studies by E. N. Todhunter on a comparison of highly colored and poorly colored Delicious and Jonathan apples as a source of vitamin C, the vitamin A value of Delicious apples, the influence of soil fertilizer on the vitamin C value of Winesap apples, and the vitamin C value of Esopus (Spitzenberg) apples and frozen red raspberries, and by M. Boggs on the quality factors of cooked frozen-pack peas.

The scientific basis for experimental baking tests, M. C. Markley. (Minn. Expt. Sta.). (*Cereal Chem., 14 (1937), No. 6, pp. 834–840, figs. 3*).—The author describes the Latin Square method of baking test in which the mixing and fermentation times are varied simultaneously and the effect upon the combined quality score of the resulting bread is noted. Strong high-diastatic and weak low-diastatic spring-wheat flours and low protein hard winter-wheat flour of good diastatic activity were used in the test loaves. From a study of the data obtained, the subjection of different types of flours to a single fixed condition of mixing and fermentation in the baking test appears to be a very questionable practice.

A comparison of 1X, 2XX, and 4XXXX tin pans in experimental baking, D. F. Worley and C. F. Davis (*Cereal Chem., 14 (1937), No. 5, pp. 769, 770*).—The findings of the committee in the report previously noted (E. S. R., 77, p. 562) have been extended to further studies of different gage tinned metal experimental baking pans. By the A. A. C. C. baking test procedure test loaves were baked in the modified low form and the tall form A. A. C. C. pans of 1X, 2XX, and 4XXXX tinned metal. No differences were noted in the mean loaf volumes, and the characteristics such as crust color, break and shred, and grain and texture were not affected by the different gage tinned metal in the pans.

Experiments in determining bread flavor, W. H. Cathcart (*Cereal Chem., 14 (1937), No. 5, pp. 735–751*).—A practical method of testing bread flavor which may be used by a baker to determine taste preferences of customers is presented in detail. The application of the method to a group of judges and the analysis of the results are given.

Nutritive value of aquatic products, R. H. Fiedler (*U. S. Dept. Com., Bur. Fisheries, Admin. Rpt. No. 27 (1938), pp. 26–28*).—Progress reports are given on studies on the vitamin A and D content of fish-liver oils, the vitamin A content of fresh fish flesh, the chemical composition and nutritive value of fish proteins, and the mineral constituents of fishery products and byproducts.

Fruits for year around use, R. M. Griswold (*Michigan Sta. Circ. 164 (1938), pp. 51*).—This circular contains about 160 recipes, using cherries, blueberries, peaches, and grapes.

The nutritive value of the proteins of nuts in comparison with the nutritive value of beef proteins, H. H. Mitchell and J. R. Beadles (*Jour. Nutr., 14 (1937), No. 6, pp. 597–608*).—Continuing a previous study (E. S. R., 76, p. 879), the authors obtained the following average biological values: Beef round 76 percent, cashew nut 73, English walnut 56, Brazil 54, almond 51, and filbert 50 percent. The true digestibility values averaged 100, 96, 84, 96, 94, and 91 percent, respectively.

The metabolism of living tissues, E. Holmes (*Cambridge, Eng.: Univ. Press, 1937, pp. [XI]+235, figs. 2*).—This book is designed for use as an introduction to the study of the medical branch of biology and contains a foreword by F. G. Hopkins. Following general discussions of the enzymes, methods of investigating cell metabolism, and oxidations and oxidation-reduction potential, the author considers the metabolic activity of the tissues of the liver, kidney, muscle, and nervous system; the chemical coordination brought about by the hormones; and the role of the inorganic salts and the vitamins in tissue metabolism.

A simple closed-circuit metabolism apparatus for small animals, W. H. Newton (*Jour. Physiol., 89 (1937), No. 4, pp. 421–428, fig. 1*).—A simple closed apparatus for measuring oxygen consumption and carbon dioxide output of small animals is described.

Reliability of medical judgments on malnutrition, M. Derryberry (*Pub. Health Rpts. [U. S.], 53 (1938), No. 7, pp. 263–268*).—The data presented are taken from a study noted previously (E. S. R., 62, p. 687). It is shown that the differences in physicians' judgments of the nutritional status of the same children are so great that estimates based on a single examination are of very little value in determining the relative amount of malnutrition among a group of children at any one time, or as bases for determining which children of a group are malnourished. The author proposes that "research workers concentrate on the construction of valid methods of determining nutritional status rather than making surveys which are of doubtful significance because of the inaccuracies of the estimates upon which their findings are based."

Measurement of obesity by the creatinine coefficient, N. B. TALBOT (*Amer. Jour. Diseases Children, 55 (1938), No. 1, pp. 42–50*).—The proportion of subcutaneous fat to the underlying muscle was estimated in 37 children, of whom 12 were classified as obese, 15 as normal, 6 as lean, and 4 as emaciated. The creatinine content of the urine was determined on 24-hr. specimens. Each child was weighed and the percentage of muscle weight to body weight was estimated. The average creatinine coefficient reported for the obese children is 14, normal 20.5, lean 30.7, and emaciated 9. These values show a close correlation with the muscle weight of these groups, which were estimated to constitute 25, 37, 55, and 16 percent, respectively, of the total body weight. It is concluded that the creatinine coefficient, together with clinical appraisal, is an accurate index of obesity.

The author had the assistance of F. Broughton.

Digestibility, metabolism, and nutritive value of lactalbumin, M. C. KIK (*Arkansas Sta. Bul. 352 (1938), pp. 24*).—In this study, which has been noted from a preliminary report (E. S. R., 79, p. 138), 90-day growth experiments by the paired feeding technic were made on six groups of rats, two of each group receiving diets containing 8 and 12 percent protein in the form of casein and of lactalbumin and the third receiving the diet containing 8 percent lactalbumin ad libitum, and on nine pairs of rats on varying amounts of a nitrogen-free ration supplemented by the 8-percent lactalbumin diet. Metabolism experiments for six periods were made on groups of rats maintained on a low nitrogen diet during two of the periods and on 8 percent casein, lactalbumin, casein and cystine, and lactalbumin and cystine rations during the other four periods.

At the 8-percent level of protein the body weight gains were 1.65 and 2.14 g on the basis of 1 g of casein and lactalbumin, and at the 12-percent level 1.6 and 1.86 g, respectively. The food nitrogen intakes per gram of nitrogen retained were 3.8 and 3.42 g for the 8- and 12-percent casein diets and 2.66 and 2.77 g, respectively, for the two levels of lactalbumin. It is calculated that 1 g of the 8-percent lactalbumin nitrogen promoted the same storage of nitrogen as 1.42 g of the 8-percent casein and 1.23 g of the 12-percent casein nitrogen. The following biological values are reported: 12 percent casein 61 percent, 8 percent casein 69, 12 percent lactalbumin 80, 8 percent casein and cystine 83, 8 percent lactalbumin 84, and 8 percent lactalbumin and casein 85 percent. The rats on the supplemented nitrogen-free ration showed equal weight gains for 1 g of the lactalbumin nitrogen and 1.33 g of the casein nitrogen. It would appear that lactalbumin at either the 8- or 12-percent level of feeding is superior to casein for nitrogen storage and maintenance and growth and is comparable with a casein and cystine mixture.

The respiratory metabolism of rats receiving a diet deficient in inorganic constituents.—The change in basal metabolism, M. KRISS and A. H. SMITH (*Jour. Nutr., 14 (1937), No. 5, pp. 487–501, fig. 1*).—In continuation of previous studies by Eppright and Smith (E. S. R., 78, p. 277), the authors investigated the influence of the low salt diet on the basal metabolism of 10 pairs of young male rats over a period of approximately 3 mo. One rat of each pair received a diet composed of washed casein 18 percent, dextrin 55, and hydrogenated fat 27 percent, which provided 0.075 percent total ash. The pair mate received in addition 4 percent Osborne and Mendel salt mixture. The daily vitamin supplements given consisted of 200 mg dried yeast, 1 cc alcoholic extract of wheat germ, and 6 drops of cod-liver oil.

Before going on the experimental diets the mean basal metabolism of the rats was 730 calories per hour or 898 kg calories per square meter per 24 hr., with

the respiratory quotients averaging 0.739±0.005. At the end of the experimental period the average basal metabolism of the 8 surviving mineral-deficient rats was 580 calories per hour or 710 kg calories per square meter per 24 hr. as compared to 486 calories and 595 kg calories, respectively, for the control rats. The respiratory quotients remained unchanged. The results indicate that the elevated basal metabolic rate of the mineral-deficient rats over the control animals was due to the low salt intake. The decline in basal metabolism over the 3-mo. period, which was significantly greater for the control rats, was most pronounced during the first month. It is noted that the mineral-deficient rats were less active than were the control animals.

Immaturity of the organism as a factor determining the favorable influence of lactose on the utilization of calcium and phosphorus, R. B. French and G. R. Cowgill (*Jour. Nutr., 14 (1937), No. 4, pp. 383–399, figs. 2*).—Tests were made on three female dogs maintained on diets with and without lactose and in consecutive periods low in either calcium or phosphorus. The protein in the diet was supplied by dried, coagulated egg albumin and the phospho-protein casein in comparative periods. The replacement of 20 percent sucrose by lactose in the diet, regardless of the source of the protein, resulted in a marked improvement in the calcium and phosphorus balances in the two immature dogs, but had no significant effect on the mature dog. The findings were confirmed by the great variation observed in similar tests conducted on groups of female rats at different levels of maturity, and it is concluded that "'degree of immaturity' plays a role in determining the effect of lactose on the utilization of calcium by a given organism."

Control feeding technique in bone calcification studies, J. Outhouse, J. Smith, and L. Merritt (*Jour. Nutr., 14 (1937), No. 6, pp. 567–577*).—Two feeding technics for use in bone calcification studies are described. Female rats at weaning time were kept in a darkened room and for 1 week received a vitamin D-free ration. By the first technic 3 litter mate rats as identical as possible in weight, appetite, and vitality were given the basal ration consisting of low ash casein 18 percent, starch 78, Osborne and Mendel salt mixture No. IV 4 percent, supplemented by 400 mg yeast and 50 mg spinach, and two of them were placed on a paired feeding regimen in which the rat with the poorer appetite determined the quantity of basal ration consumed by both. One rat was given 50 mg cod-liver oil daily and the other an equal amount of corn oil, while the third rat received the basal ration ad libitum, with 50 mg cod-liver oil. By the second technic the calcium and phosphorus content of the salt mixture was fed separately from the basal ration, which consisted of low ash casein 18 percent, starch 79.4, and Osborne and Mendel salt mixture No. XXX, which is free from calcium and phosphorus, 2.6 percent, supplemented by 400 mg yeast, 50 mg spinach powder, and 287 mg salt mixture No. IV. As in series 1, two rats of each triad were given 50 mg of cod-liver oil daily and the third rat received no vitamin D. At the end of 28 days the animals were killed and the amount of ash deposited in the bones was determined.

In the first series the rats fed vitamin D had an average bone ash content of 58 percent and those receiving no vitamin D 51.7 percent, as compared to percent for the control animals. The average weight gains were 54, 46, and 82 respectively, for the three groups. The amount of food eaten by the animals the paired feeding plan averaged 182 g for the 28-day period. In series 2 the rats fed vitamin D had an average bone ash content of 58.6 percent and those receiving no vitamin D 53.6 percent, as compared to 58.9 percent for the control animals. The weight gains were 36, 34, and 78 g, respectively, and the amount of food eaten averaged 150 g.

The authors recommend the first technic for use in vitamin D assays on calcium-poor foods, which could be given in a large quantity without affecting the ratio or total intake of calcium and phosphorus. They prefer the second technic for use with calcium-rich foods, since the salt adjuvant can be modified so that the desired ratio and level of calcium and phosphorus may be maintained even though different quantities of the same food are given.

A comparative study of the growth-promoting and bone-calcifying effects of several carbohydrates, J. OUTHOUSE, J. SMITH, L. MERRITT, and F. R. WHITE (*Jour. Nutr., 14 (1937), No. 6, pp. 579–595, fig. 1*).—Following the technics described in the study noted above, the authors compared the influence of lactose, sucrose, and galactose with that of cod-liver oil on the increase in body weight and length and on the ash content of the bones of rats. The sucrose replaced the starch in the basal ration in amounts equivalent to from 23 to 26 percent of the caloric intake. In the first series of tests the vitamin D depleted paired female rats were given the basal ration used in the second technic, as noted above, supplemented by 287 and 384 mg of salt mixture No. IV. One rat of each triad was fed lactose or galactose, one cod-liver oil, and the third received no additions. In series 2 the controlled feeding technic was followed and the basal ration consisted of casein 18 percent, starch 67, salt mixture No. IV 4, yeast 10, and spinach 1 percent. In each group of four female rats two received the basal ration containing 25 percent lactose or sucrose substituted for an equal amount of the starch, one received cod-liver oil, and the fourth received no additions. In a third series in which the paired feeding technic was followed and the basal ration consisted of casein 18 percent, starch 47, salt mixture No. IV 4, yeast 6, and lactose or sucrose 25 percent, male rats not previously depleted of their vitamin D stores were employed.

In series 1 the average bone ash content of the rats receiving 287 mg salt mixture No. IV and 2 g lactose was 60 percent, the rats receiving cod-liver oil 61.7, and the control group 56 percent. The comparable values for those receiving 1.2 g lactose were 54.7, 57.9, and 50.1 percent, respectively. The average values for the rats receiving 1.2 g lactose and 384 mg salt mixture No. IV and 0.6 g galactose and 287 g salt mixture No. IV and their triad mates lay between these values. The weight gains of the groups receiving the carbohydrate supplements ranged between 34 and 41 g, those receiving cod-liver oil 55 and 71 g, and the control group 31 and 33 g. The food intakes of the three groups averaged 145, 222, and 161 g, respectively. In series 2 the gains in weight averaged 35 g for the sucrose, 33 for the lactose and starch rations, and 39 for the cod-liver oil ration, and the final body lengths averaged 154, 154, 155, and 158 mm, respectively. The ash content of the bones averaged 53.5 percent for the sucrose, 56.5 for the lactose, 53.7 for the starch, and 57.4 percent for the cod-liver oil rations. The food intake averaged 153 g for the 28-day period. In series 3 the bone ash content averaged 53.1 percent for the sucrose and 56.3 percent for the lactose ration, and the gains in weight were 68 and 67 g, respectively, with the food intake averaging 216 g for the 35-day period.

It is concluded that lactose, sucrose, and galactose fed at the level of 25 percent of the caloric intake in the paired feeding tests did not exhibit any growth-promoting value superior to that of starch, but that the lactose caused an acceleration in the calcification of the bone under both ad libitum and control feeding conditions. The acceleration did not equal that shown by the rats receiving cod-liver oil.

The shortage of calcium in the "poorer class" diet, K. H. COWARD, E. W. KASSNER, and L. W. WALLER (*Brit. Med. Jour., No. 4018 (1938), pp. 59–64, fig. 1*).—An experiment was conducted over a 6-week period on four groups

of rats maintained on a diet typical of the ordinary diet of the poorer classes and consisting largely of bread, margarine, jam, potatoes, and small amounts of meat, milk, and fresh vegetables. Three of the groups were given supplements in amounts calculated to supply about one-twentieth of the caloric requirement. On the basis of increase in body weight halibut-liver oil plus dried milk supplement had the most beneficial effect, cod-liver oil was almost as effective, and virol had very little effect. On the basis of ash content of the bones all three supplements were ineffective.

In a second experiment on six groups of rats receiving the same diet supplemented by a very large dose of cod-liver oil, the milk supplement was distinctly beneficial and the salt mixture ineffective in increasing body weight. The rats receiving no supplement had a bone ash content of 39.7 percent as compared to from 45.74 to 52.03 percent for the rats receiving from 5 to 15 cc of milk and from 42.83 to 52.12 percent for the rats receiving from 0.02 to 0.18 g of the calcium and phosphorus mixture, which is about the normal percentage for rats. "This proves quite clearly that the ordinary mixed diet of the poorer classes is seriously deficient in the elements required for the calcification of bone."

Studies on the alleged toxic action of cod liver oil.—Observations on growth and pathologic changes in animals fed large amounts of cod liver oil, E. Burack and H. M. Zimmerman (*Jour. Nutr., 14 (1937), No. 6, pp. 535–551, figs. 3*).—The effects of feeding large amounts of cod-liver oil to mice and the influence of yeast upon the growth of rats and mice maintained on high cod-liver oil and peanut oil diets were investigated.

The growth rate was slower in the mice maintained on a diet containing 20 percent cod-liver oil than in the mice receiving the same amount of peanut oil as the sole source of fat. The rats maintained on diets containing 18 and 27 percent by weight of cod-liver oil had a slower growth rate than did the rats receiving peanut oil. The addition of yeast did not exert any beneficial effect on growth. Histological examination revealed pathologic changes in the heart in 14, in the liver in 6, and an enlarged spleen in 23 out of 52 mice ingesting a 20-percent cod-liver oil diet for a period of at least 150 days. No lesions were demonstrated in the control mice ingesting peanut oil. In 5 out of 18 rats receiving the 27-percent cod-liver oil diet and in 3 out of 9 receiving the control diet containing peanut oil pathological changes were found in the heart. "It is pointed out that in view of the small percentage of animals which yielded changes in the organs as a result of cod-liver oil feeding at high levels, the claims that cod-liver oil in therapeutic doses can exert injurious effects are not substantiated."

The findings in vitamin and hormone research, I, edited by L. Ruzicka and W. Stepp (*Ergebnisse der Vitamin- und Hormonforschung. Leipzig: Akad. Verlagsgesell., 1938, vol. 1, pp. XVI+470, figs. 44*).—The volume is composed of a foreword by F. G. Hopkins and the following review papers: The Essential Vitamin Problems of Childhood [trans. title], by E. Glanzmann (pp. 1–67); The Assessment of Vitamin C in the Organism [trans. title], by A. Giroud (pp. 68–113); The Chemistry of the Hormones of the Posterior Lobe of the Pituitary Gland, by R. L. Stehle (pp. 114–139); The B-Vitamins, Except B_1 and the Flavins, by C. A. Elvehjem (pp. 140–158); The Role of the Substance Ergone, Enzyme and Auxiliary Substance in the Living Cell [trans. title], by H. von Euler (pp. 159–190); The Exchange Relationship Between the Hypophyses and the Sex Glands [trans. title], by W. Berblinger (pp. 191–212); Chemistry of Vitamin B_1 (Thiamin), by R. R. Williams (pp. 213–262); The Vitamins and Reproduction [trans. title], by H. Guggisberg (pp. 263–333)

The Chemistry of Cortin and Accompanying Substances [trans. title], by T. Reichstein (pp. 334–370); The Chemistry of the Male Sex Hormones [trans. title], by M. W. Goldberg (pp. 371–418); and The Chemistry of the Oestrogenic Hormones, by G. F. Marrian (pp. 419–454).

Progress in the vitamin field, W. H. Eddy (*Jour. Amer. Dietet. Assoc., 13 (1937), No. 3, pp. 223–234*).—The author reviews the research findings on the vitamins A, B_1, B_6, C, D, the filtrate factor, and lactoflavine. The vitamins E, H, K, B_3, B_4, B_5, "F", and the gizzard erosion factor are briefly noted. "What is most needed today is a recognition of body symptoms that will tell definitely whether we have had enough, too little, or too much of each of the vitamins." A bibliography contains 32 references to the literature.

Newer outlook on vitamin therapy [trans. title], A. v. Szent-Györgyi (*Deut. Med. Wchnschr., 63 (1937), No. 48, pp. 1789–1791*).—This is a general discussion of the changing views in vitamin therapy. It is pointed out that until recently vitamins were considered by the practicing physician only in connection with the prevention and cure of definite avitaminoses or deficiency diseases, and the daily requirement was defined as the amount required for the prevention of such diseases. With the discovery, isolation, and synthesis of certain of the vitamins it has been possible to study further their physiological action, with the result that the conception of vitamin requirements has changed to the minimum amount necessary to maintain the best possible health, or a condition of optimal nutrition. In the opinion of the author the richest field for future medical research lies in the wide zone between health and definite avitaminoses.

The carotene and vitamin A content of the fetal liver and the amniotic fluid [trans. title], G. Gaehtgens (*Klin. Wchnschr., 16 (1937), No. 31, pp. 1073–1075*).—The carotene content was determined photometrically and the vitamin A colorimetrically by the Carr-Price color reaction with stannous chloride in four premature and five full-term fetuses ranging from 5 to 10 mo. of age.

Expressed as gammas of carotene per 100 g of liver, the values obtained varied from 35γ in a 5- to 6-mo. fetus to 2γ in a 10-mo. fetus and the vitamin A values from 300 Lovibond units in a 10-mo. fetus to 75,000 units in a 5- to 6-mo. fetus. For the four premature fetuses the average carotene content of the liver was 16.8γ and the vitamin A content 23,814 units as compared to 11γ of carotene and 11,630 units of vitamin A for the five full-term fetuses. The carotene content of the amniotic fluid ranged from 0γ to 4.7γ, with one high value of 24γ, and the vitamin A content from 0 to 10.5 units per 100 cc. of fluid.

The content of carotene and vitamin A in the placenta [trans. title], G. Gaehtgens (*Klin. Wchnschr., 16 (1937), No. 31, pp. 1075, 1076*).—Following the methods of assay noted in the paper above, the author estimated the carotene and vitamin A content of the petroleum ether extract containing the unsaponifiable fraction of the placental tissue from 28 fetuses obtained as soon as possible after birth.

The carotene content ranged from 2γ to 39γ, with two high values of 115γ and 300γ, and the vitamin A content from 0 to 30 Lovibond units. In 2 cases which had received therapy during pregnancy, the carotene values of the placental substance were 12γ and 21γ, and the vitamin A values were 125 and 120 units, respectively. It is concluded that vitamin A is stored in the placenta during pregnancy.

Effect of different methods of cooking on the vitamin B content of pinto beans, E. M. Lantz (*New Mexico Sta. Bul. 254 (1938), pp. 11, figs. 4*).—In this report of an investigation which has been noted in progress (E. S. R., 79, p.

129), the content of vitamin B (B_1) in raw and cooked pinto beans as determined by bio-assay on rats is presented. Groups of rats were given a vitamin B_1-free diet supplemented by 0.2, 0.25, and 0.3 g of beans daily for a 4-week period, and the weight changes and signs of polyneuritis were noted. The following average weekly weight gains are reported for the rats receiving 0.3 g of the bean supplements, raw and cooked by different methods: Raw 7.3 g; soaked 16 hr. in distilled water, drained, and boiled 2¾ hr. in distilled water 4.9 g; soaked 16 hr., drained, parboiled 15 min., and cooked 30 min. in distilled water at 248° F. 4.9 g; soaked 16 hr., drained, parboiled 15 min., and cooked 45 min. in distilled water at 239° 6.1 g; boiled in tap water for 6 hr. without soaking 2.9 g; soaked 16 hr. in a 0.5 percent solution of sodium bicarbonate, drained, and boiled 2¾ hr. in distilled water 2.9 g; and soaked in the bicarbonate solution, drained, parboiled 15 min., and cooked 45 min. in tap water at 239° 1.3 g. At the two lower levels of bean supplement, the weight changes of the groups were in the same general relationship to each other, with polyneuritis and death occurring in four of the groups on the 0.25-g level and in six on the 0.2-g level.

The results show that the vitamin B_1 content of pinto beans is retained to the greatest extent when the beans are soaked, parboiled, and cooked in soft water for 45 min. at a temperature of 239° in a pressure cooker, and the greatest loss occurs when the beans are soaked in an alkaline solution and cooked by the same method, using tap water.

The rôle of vitamin B_1 in cardiovascular diseases, W. A. Jones and B. Sure (*Jour. Lab. and Clin. Med., 22 (1937), No. 10, pp. 991–997; abs. in Arkansas Sta. Bul. 351 (1938), pp. 9, 10*).—In this preliminary report the authors present the results of a study conducted on 18 patients with cardiac diseases who were placed on a diet having an average content of 325 g of carbohydrate, 100 of protein, and 100 g of fat, and supplemented by approximately from 1,500 to 2,200 units of vitamin B_1 daily and 2 glassfuls of orange juice. The urinary excretion of vitamin C was determined by the Harris and Ray modification of the Tillmans method (E. S. R., 73, p. 427) in 18 of the more severe cases following a 12- to 14-day period when 500 mg of cevitamic acid in the form of orange juice was ingested.

Before saturation the daily urinary excretion of vitamin C varied from 32 to 81 mg in 17 patients and in one case was 133 mg. Following saturation, 13 patients excreted less than 30 percent of the test dose, which would indicate an abnormal vitamin C metabolism. The remaining 5 patients excreted from 37 to 63 percent of the test dose of cevitamic acid. All the patients showed improvement in respiration, pulse rate, and blood pressure. The importance of vitamin B_1 as a therapeutic in cardiovascular diseases has not been established.

The ascorbic acid content of human tonsils [trans. title], J. and L. Mélka (*Klin. Wchnschr., 16 (1937), No. 35, pp. 1217–1219*).—Ascorbic acid analyses by the methylene blue method of Martini and Bonsignore (E. S. R., 73, p. 746) were made of freshly removed hypertrophic tonsils from 141 subjects from under 10 to over 40 yr. of age and of normal tonsils from 27 autopsies. The values, as reported by 10-yr. age groups, show a decreased content of ascorbic acid in milligrams per gram of tonsil with increasing age from an average of 0.312 mg per gram for 32 cases under 10 yr. to 0.17 mg per gram for 3 subjects over 40 yr. of age. The average value of the presumably normal tonsils was still lower, 0.09 mg per gram of tonsil. The average weights of the hypertrophic tonsils increase with age up to 40 yr., and in all of the age groups were higher than the normal tonsils.

The addition of glucose, maltose, lactose, and sucrose to surviving tonsil tissues suspended in physiological or Ringer solution resulted in the majority of cases in an increase in ascorbic acid. This is thought to suggest the possibility of synthesis of vitamin C in vivo in hypertrophic tonsils. In possible confirmation of this it is noted that the capillary resistance of certain patients with hypertrophic tonsils was significantly higher than normal controls.

Excretion of vitamin C in sweat, R. E. Bernstein (*Nature [London], 140 (1937), No. 3546, pp. 684, 685*).—It is noted briefly that the vitamin C content of a series of samples of sweat collected from Bantu mine laborers (South Africa) during 1-hr. heat tolerance tests under conditions comparable to those encountered in underground mines and analyzed by the method of van Eekelen and Emmerie (E. S. R., 76, p. 155) varied between 0.5 and 1.1 mg per 100 cc. From the weight losses of the subjects during the test it was estimated that the excretion of vitamin C through the sweat under conditions existing in underground mines would amount to about 2 mg per hour or 16 mg during the 8-hr. shift. This is thought to explain in part the frequency of scurvy, both acute and latent, among Bantu mine workers who cannot afford a liberal diet.

The absorption of vitamin C.—Modification of the Tillmans method for the determination of ascorbic acid in colorless body fluids [trans. title], N. Berend and M. Fischer (*Biochem. Ztschr., 291 (1937), No. 4–6, pp. 221–228, fig. 1*).—A modification of the Tillmans method of determining ascorbic acid as applied to blood is described in which deproteinization of the plasma or serum is dispensed with. The blood to be tested is left for 30 min. in a cold place and is then centrifuged and the serum acidified with 2 volumes of 0.25 N HCl to a pH of 1.5–3.5 and titrated directly with 2 percent dichlorophenolindophenol. In all titrations a correction is made by subtracting 0.03 cc from the final reading. Data are reported on the recovery of added ascorbic acid and on the content of reduced and total ascorbic acid in various parts of the blood serum of fasting cats during the absorption of ascorbic acid administered in various ways.

During the absorption of vitamin C the content of the lymph was increased. In the first hour the content in the portal blood was doubled, and a similar increase occurred in the blood of the inferior vena cava. No reversibly oxidized ascorbic acid could be detected. The content in the liver was increased by about 67 percent, but only 10 percent of the added ascorbic acid could be accounted for. In the intestines 50 mg less ascorbic acid could be accounted for than the amount absorbed at the height of the reaction. Only a part of this loss could be attributed to intestinal bacteria.

The action of intestinal bacteria on ascorbic acid (vitamin C), W. B. Esselen, Jr. (*Jour. Bact., 35 (1938), No. 3, p. 340*).—In contradiction to results previously reported by other workers various types of intestinal bacteria were found to exert a protective action on reduced ascorbic acid. This protection appeared to vary directly with the suitability of the medium for bacterial growth and the number of organisms present. Various possible reasons for this action are suggested, with the conclusion that the effect is probably due to the ability of the bacteria to produce carbon dioxide.

Influence of vitamin C on diphtheria toxin, J. Pakter and B. Schick (*Amer. Jour. Diseases Children, 55 (1938), No. 1, pp. 12–26, figs. 2*).—The effects of cevitamic acid (vitamin C) administered orally, intravenously, intramuscularly, subcutaneously, and intracutaneously on the Schick reaction were studied in a group of 14 convalescent children with positive reactions to the Schick test.

Judged by the persistence of undiminished positive reactions to the Schick test, the administration of as much as 1,100 mg of the vitamin C was ineffective regardless of the mode of administration. When a mixture of diphtheria toxin and

vitamin C was injected intracutaneously a slight neutralizing effect was noted which became stronger as the mixture was allowed to stand. "The neutralizing effects of vitamin C are probably due to nonspecific inactivation brought about by changes in the pH or by alterations due to changes made by the acid in the oxidation-reduction system or to both factors."

The treatment of lung inflammation with vitamin C [trans. title], A. Vogl (*München. Med. Wchnschr.*, *84* (1937), *No. 40, pp. 1569–1572, fig. 1*).—This report deals with the use of ascorbic acid in the treatment of postoperative pneumonias and as a prophylactic agent following operations. As soon as the diagnosis of pneumonia has been made the patient is given 200 mg of ascorbic acid by subcutaneous injection, and during the next 5–8 days a total of from 200 to 500 mg in small doses 3 times a day. It is thought preferable after the first massive dose to use the small daily doses rather than larger doses.

This treatment was found to have a somewhat different effect upon lobar and bronchial pneumonias. In lobar pneumonia the fever dropped almost to normal on the morning after the first treatment and rose again during the day, although not as high as before the treatment. After 3 or 4 daily remissions, with progressively lower evening temperature, the patients became fever-free on the fourth day, or at the latest the fifth day. Subjective symptoms were greatly improved, but the inflammatory processes ran their course without being influenced by the treatment.

In bronchial pneumonia the fever disappeared in from 2 to 5 weeks of vitamin C therapy, but the patients expectorated for from 2 to 8 days after the fever had left. As in lobar pneumonia, the subjective symptoms improved before the objective, although the difference was not quite so marked.

Vitamin C was also used successfully as a prophylactic measure for other conditions, particularly abdominal operations and rib fractures. The treatment consisted in the administration of about 100 mg of vitamin C daily in one to three ampoules or as the juice of two lemons.

Data are also included on the vitamin C excretion in certain cases. In three cases of lobar pneumonia responding favorably to vitamin C therapy, the total vitamin C consumption varied with the age of the patient. A child who was given 3,000 mg of ascorbic acid during the course of the treatment excreted about 1,400 mg, an adult receiving 1,700 mg excreted about 400, and an old man receiving 1,700 excreted 200 mg. In the first days of the illness much vitamin C is metabolized. During the course of the pneumonia there is a greater or less excretion but never more than the day's intake. When the body no longer needs the vitamin the excess is excreted. This is earlier the younger the subject.

In explanation of the favorable effect of vitamin C in the prevention of postoperative pneumonia, it is suggested that for a few days after an operation bu[t] little food is eaten, with resulting decrease in the vitamin C supply. This gives [a] favorable condition for the development of infection unless additional vitamin [C] is administered.

Vitamin C subnutrition in Indians, K. Ramakrishnan Nair (*Cur. Sc[i.]* [*India*], *6* (*1938*), *No. 7, pp. 324, 325*).—Among 15 South Indian subjects, chie[fly] students on a middle class diet, only 3 showed satisfactory vitamin C nutriti[on] as determined by the criteria of marked increase in excretion in response to [a] single massive dose (600 mg) of vitamin C. In only these 3 subjects we[re] more than 100 mg of the ascorbic acid excreted within 24 hr. following t[he] test dose.

The results are thought to confirm the conclusions of Ranganathan a[nd] Sankaran (E. S. R., 78, p. 729) that partial deficiency of vitamin C is [the] rule in the South Indian middle class dietary.

Experimental production and pathogenesis of gastric ulcers caused by vitamin C deficiency [trans. title], H. HANKE (*Klin. Wchnschr., 16 (1937), No. 35, pp. 1205, 1206*).—In a considerable portion of a group of 35 guinea pigs in a state of acute or chronic scurvy, erosive changes resembling gastric ulcer were present in the pylorus and upper duodenum. In animals kept for a long time in a state of subclinical scurvy, there was very little evidence of regeneration of the gastric mucosa. The condition is compared with gastric ulcer in man, with the suggestion that vitamin C treatment should be given not only because lack of vitamin C probably exacerbates the condition but also because ulcer diets are low in vitamin C. Vitamin C treatment is also recommended as a post-operative measure.

The question of vitamin P [trans. title], T. MOLL (*Klin. Wchnschr., 16 (1937), No. 47, p. 1653*).—Attempts to use hesperidin, hesperetin, diosmin, and phlorhizin in place of ascorbic acid in curative tests on guinea pigs gave negative results, as was also true of attempts to use these materials as supplements to suboptimal doses of ascorbic acid. In the author's opinion the existence of a vitamin P and its identity with hesperidin can be refuted.

The effect of irradiated milk compared with vitamin-D oils on inhalation tuberculosis of guinea pigs, W. STEENKEN, JR., and E. R. BALDWIN (*Amer. Rev. Tuberc., 35 (1937), No. 5, pp. 656–660, fig. 1*).—Four hundred tuberculin-tested guinea pigs receiving a basal diet consisting of hay, oats, fresh carrots, and dried skim milk were divided into four equal groups and given twice irradiated cream containing not more than 33 U. S. P. units of vitamin D, nonirradiated milk from the same source, cod-liver oil followed by tuna-liver oil containing not more than 33 U. S. P. units of vitamin D, and 10 times the amounts of cod- and tuna-liver oils to supply 330 U. S. P. units of vitamin D daily. The animals were exposed to a virulent strain of the tubercle bacilli in an inhaler.

The results do not show any evidence of vitamin D influence on the development and course of inhalation tuberculosis in adult guinea pigs. Similar lesions were produced in the animals receiving irradiated and plain cream and those receiving the oils. A lowered resistance was shown in the animals receiving the large dose of cod- and tuna-liver oils.

On the factors determining rickets in rats fed on cereal diets, J. C. MOTTRAM and N. PALMER (*Cereal Chem., 14 (1937), No. 5, pp. 682–686*).—The production of rickets was studied in groups of rats, 3 in each group, maintained on different diets containing white flour, germ flour (75 percent white flour and 25 percent wheat germ), oatmeal, corn meal, or potato starch. The calcium : phosphorus ratio of the diets varied from 1 : 0.38 to 11.4 : 1.

The results show that severe rickets developed in the rats receiving the diets containing pure cereals which had a low calcium content. When the calcium content of these diets was increased so that the calcium : phosphorus ratio was close to 1 : 0.5, rickets did not develop. The inclusion of more calcium made the cereal diets again rickets-producing, which was prevented by the administration of vitamin D.

Anaemia in preschool children: Its incidence in south London, T. COLVER (*Lancet [London], 1938, I, No. 5, pp. 245–247, figs. 3*).—In a group of 310 "normal" children, 36 percent of the 1-year-old, 27 of the 2-, 20 of the 3-, and 15 percent of the 4-year-old children were judged to be anemic by comparison of the hemoglobin content with the suggested standard hemoglobin range of approximately 10–11.5 g per 100 cc for children between 1 and 5 yr. of age. The incidence is doubled when the comparison is made with the suggested "iron standard," which has a mean value of 12.4 g for children between 6 mo. and

5 yr. Thirty-two children below the lower limit of the iron standard responded to iron therapy. The study indicates the necessity of establishing the normal hemoglobin range in childhood.

Report of two cases of botulism in Massachusetts, H. Rosen and N. Gordon (*New England Jour. Med., 218 (1938), No. 12, pp. 524–526*).—The case histories of two patients who acquired botulism through eating home-canned mushrooms are presented. Recovery followed the administration of 135,000 and 50,000 units, respectively, of polyvalent botulinus antitoxin within 72 hr. after the ingestion of the food and 24 hr. after the onset of symptoms.

A diabetic manual for the use of doctor and patient, E. P. Joslin (*Philadelphia: Lea & Febiger, 1937, 6. ed., rev., pp. 219, [pls. 2], figs. 48*).—A revision of this well-known volume, earlier editions of which have been noted (E. S. R., 73, p. 430).

TEXTILES AND CLOTHING

Variation in the shrinkage of Wyoming wools.—I, Differences between duplicate samples, R. H. Burns. (Coop. Tex. Expt. Sta.). (*Wyoming Sta. Bul. 225 (1938), pp. 34, figs. 5*).—A method of sampling at the shearing sheds to determine the shrinkage of large lots of wool was tested, 1927–30, 1932–36. One or more sets of duplicate samples, about 8 lb. per sample, were taken from each clip studied. The test of accuracy, the difference of shrinkage between the samples in a pair, was the only test available for many of the clips sampled. Large bags of wool from 11 clips, weighing from 250 to 350 lb., were scoured and the shrinkage of the bagged wool compared with that of the pair of small samples from the same clip.

The average difference between the samples in the same pair was 1.55 percent and usually was less than 2 percent, indicating that small samples, in a large percentage of the cases, can be considered reliable indicators of the true shrinkage of clips sampled. Scattered pairs in which the difference in shrinkage ranged from 4 to 6.5 percent showed that those particular samples were of no value for shrinkage estimates. In shrinkage, the small samples differed from large bags by as much as 5.8 percent, but in only 3 of 11 cases did the difference exceed 3 percent. In 6 cases the small samples and the bags differed in shrinkage by less than 1 percent, showing also a considerable degree of reliability for shrinkage of small samples. In the 3 cases where the shrinkages of the small samples exceeded those of the corresponding large samples the largest difference was less than 0.5 percent, showing the tendency of the small samples to indicate lower shrinkages than large ones.

The determination of yield and shrinkage of wool by scouring small samples, J. F. Wilson (*Hilgardia [California Sta.], 11 (1938), No. 4, pp. 145–172, figs. 13*).—Technic in wool shrinkage determinations discussed includes the plans, structural details, and directions for the operation of a new fleece opener for shrinkage tests, said to have many advantages over one developed earlier (E. S. R., 59, p. 195) at the station, and procedures for scouring the wool sample including results of tests of different laboratory methods of experimental wool scouring and comparison of the relative merits of laboratory v. commercial scouring.

"The soap-and-soda method of scouring by hand yields excellent results, and its use is indicated where the highest degree of accuracy is desired. For certain types of experiments, either the electric washer or dry cleaning may be used. Both methods are easier and no more expensive than hand-scouring. Their greater convenience as compared with hand-scouring and the fact that the shrinkage

figures obtained by their use are not wholly out of line with hand-scouring suggest that either of them may be used under certain circumstances."

Single and multiple-fiber tests for determining comparative breaking loads of wool fibers, J. F. WILSON and E. B. ROESSLER (*Hilgardia [California Sta.], 11 (1938), No. 4, pp. 173–182, figs. 2*).—Breaking load tests of cross-bred 56's (Romney-Rambouillet) made with the normal and modified Deforden apparatus demonstrated that the mean breaking load obtained from breaking 39 or 40 pieces of yarn of 20 fibers each would furnish as reliable an index of the true breaking load as that obtained from tests of 500 individual fibers. The yarn test described has such an advantage over single-fiber tests for breaking load determinations that its substitution is indicated.

1937 Year Book of the American Association of Textile Chemists and Colorists, Vol. XIV (*New York: Amer. Assoc. Textile Chem. and Color., 1937, vol. 14, pp. 646, [pl. 1], figs. [54]*).—This yearbook contains an account of the activities and accomplishments of the Association during 1937, the reports of committees, the official and tentative standard A. A. T. C. C. test methods, classified lists of American-made dyes and textile chemistry specialties, and a membership roster.

HOME MANAGEMENT AND EQUIPMENT

Development of low-cost electric cooking equipment, P. B. POTTER, F. H. BASS, and S. M. BEANE. (Coop. T. V. A.). (*Virginia Sta. Bul. 310 (1937), pp. 35, figs. 12*).—Performance and life tests were made on seven 1- and 2-burner hot plate electric stoves ranging in price from 98 ct. to $4.98. The performance tests were compared with tests made on four 2- and 3-burner stoves of the same type made in the laboratory from materials costing from about $4.50 to $14. The details of the construction are given, with diagrams for the hot plate stoves, including a special 3-burner one with extra fireproof insulation mounted in a wooden cabinet, for a complete electric range with top surface oven costing about $26 for the materials, for an electric stove made from an old kerosene stove at a cost of about $7.20 for the materials, for the wiring of a low-cost kerosene oven costing about $4.75, and for the conical burners used in the stoves.

The time required by the commercial stoves for the burners to heat varied from 3 to 6 min., with the measured wattages ranging from 990 to 524 and the maximum temperatures produced from 228° to 367° F., with the burner on one stove reaching 437°. Five of the stoves gave off heat to the table-top surface under the stove. The four laboratory-made stoves required from 5 to 8 min. to heat up to temperatures ranging from 402° to 501°, with the measured wattages ranging from 1,710 to 1,020 and no noticeable heat produced under any of the stoves. The 10 separate burner units of the commercial stoves required from 37 to 68 min. and used from 0.56 to 0.61 kw-hr. of electricity from a cold start and from 35 to 60 min., with from 0.51 to 0.56 kw.-hr. from a hot start to evaporate 1 lb. of distilled water as compared to from 28 to 41 min., using from 0.65 to 0.74 kw.-hr., and from 23 to 35 min., using from 0.56 to 0.64 kw.-hr., respectively, for the laboratory-made stoves. When the commercial stoves were tested at full heat 10 hr. a day, with 100 operations of the switches each day, 6 burners had failed before the end of about 50 hr., 3 more before 190, and only 1 was still useful after 200 hr. Most of the failures were in the switches and wiring.

While the authors do not recommend the home construction of a complete electric range, they report that a serviceable, adequate, and satisfactory hot plate stove can be made at a cost of about $4.50 for the materials for a 2-burner and

$6 for a 3-burner type. The conical burners were found to be efficient and cheap but not very durable. The test ovens proved satisfactory for cakes but only fair for pie crust and biscuits. The ovens were not efficient in the use of electric current. By the use of a method whereby each part of the element in the unit is controlled directly by a single-pole switch, it was possible to hold a uniform temperature throughout a baking period of from 60 to 90 min. in the test ovens.

MISCELLANEOUS

Forty-ninth Annual Report [of Arkansas Station], 1937, C. O. BRANNEN ET AL. (*Arkansas Sta. Bul. 351 (1938), pp. 94, figs. 2*).—The experimental work not previously abstracted is for the most part noted elsewhere in this issue.

Report of the director [of the New Haven Station] for the year ending October 31, 1937, W. L. SLATE (*Connecticut [New Haven] Sta. Bul. 409 (1938), pp. 269–325, fig. 1*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Report of the director [of the Storrs Station], 1937, W. L. SLATE (*[Connecticut] Storrs Sta. Bul. 221 (1937), pp. 43*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue. Meteorological data are also included.

The Fiftieth Annual Report of the Maryland Agricultural Experiment Station, [1937], H. J. PATTERSON (*Maryland Sta. Rpt. 1937, pp. XLIV+444, figs. 76*).—In addition to experimental work previously noted or referred to elsewhere in this issue, this report includes reprints of Bulletins 397–409.

The first twenty-five years of the Northeast Experiment Station, Duluth, M. J. THOMPSON (*Minnesota Sta., Northeast Substa., 1938, pp. 12, figs. 10*).—The development of this substation is reviewed.

Fifty-eighth Annual Report of the New Jersey State Agricultural Experiment station and the Fiftieth Annual Report of the New Jersey Agricultural College Experiment Station for the year ending June 30, 1937, J. G. LIPMAN (*New Jersey Stas. Rpt. 1937, pp. XXIII+146*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Fiftieth Annual Report of the South Carolina Experiment Station, [1937], H. P. COOPER ET AL. (*South Carolina Sta. Rpt. 1937, pp. 165, figs. 30*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Forty-seventh Annual Report [of the Washington Station], 1937, E. C. JOHNSON ET AL. (*Washington Sta. Bul. 354 (1937), pp. 89*).—The experimental work not previously referred to is mostly noted elsewhere in this issue.

NOTES

California University and Station.—The personnel and facilities of a nondegree course in home economics offered by the College of Agriculture on the Davis campus have been combined with those of the department of household science of the College of Letters and Science at Berkeley to form a single division of home economics in the College of Agriculture which will function on both the Davis and Berkeley campuses. Students may enroll with either group, but as planned at present the junior year must be spent at Berkeley. It is anticipated that the general program designed for preparation for teaching, extension work, and home making will be most popular, but it will be possible to major in specialized fields. The staff of the new division will be headed by Dr. Agnes Fay Morgan as professor of home economics and biochemist in the station. Louise C. Struve, assistant professor of home economics and assistant home economist of the station, will act as local chairman at Davis.

Connecticut State Station.—Dr. A. A. Dunlap, associate botanist, has accepted a position as chief of the department of pathology and plant physiology in the Texas Station as of July 1. Frances Clark has been appointed cytological technician in the genetics department. A fellowship for the study of field corn breeding, which has been provided by the Eastern States Farmers Exchange, has been awarded to L. H. Roberts as of July 2.

Illinois Station.—A department of forestry has been established, headed by Dr. John Nelson Spaeth, who has been assistant professor of forestry in Cornell University and silviculturist of the Cornell Station. Associated with him will be J. E. Davis, extension forester of the college and the State Natural History Survey, and L. B. Culver, assistant in forestry extension.

Kansas Station.—A contract has been let for the construction of an experimental greenhouse and a head house serving these sections and two built at an earlier date. The cost of this construction will be approximately $30,000. Much needed facilities for the departments of agronomy and botany will be provided.

Kling L. Anderson has been appointed in charge of pasture improvement investigational work as of July 1.

Massachusetts College and Station.—John C. Graham, organizer and for 27 years head of the poultry husbandry department, retired June 30.

Minnesota University and Station.—Dr. Clyde H. Bailey, professor of agricultural biochemistry and agricultural biochemist, has been appointed vice director of the station. H. B. Roe, professor of agricultural engineering and agricultural engineer, became acting chief of the division of agricultural engineering on July 1.

Missouri University and Station.—Announcement is made that Dr. F. B. Mumford will continue as dean emeritus, conducting research on the organization and administration of agricultural education in the United States. Dr. C. E. Lively, professor of rural economics in the Ohio State University and associate rural economist, has been appointed head of the department of rural sociology.

Montana College and Station.—The station has recently received a substantial donation of funds for the purchase of laboratory equipment with which the

animal husbandry department will conduct a program of wool research. The annex to the livestock judging pavilion has been remodeled to provide laboratory quarters. D. W. Chittenden, head of the department since 1934, has resigned, effective July 1, to become livestock field representative for four farm publications of the Corn Belt area, with headquarters at Kansas City, Mo.

North Dakota Station.—Herbert C. Hanson has been appointed director as of August 1. Other appointments effective July 1 include Darlene M. Knowles as home economics specialist to conduct research in nutrition problems and rural and urban family life and to direct studies on home making; and Stanley Saugstad as assistant in entomology, to assist in field studies relative to the life cycle and control of insects and wild life.

Ohio Station.—Gifts of land totaling 225 acres in Greene County have been turned over to the station by Hugh T. Birch of Yellow Springs as a memorial to the late Dr. Edward Orton. The donor has directed that the land be used for reforestation and recreation. A new State Forest of 900 acres, which has recently been established in Lorain County as a gift of Judge Guy B. Findley of Elyria, will be used for experiments for forest planting and forest management.

The honorary degree of D. Sc. has been conferred upon Director Edmund Secrest by the College of Wooster. Charles A. Martin has been appointed assistant in entomology.

Virginia Polytechnic Institute.—A grant of $49,000 has been made by the General Education Board for the development of teaching and research in agricultural economics and rural sociology during the next biennium. About half this amount is to be used for increasing the staff in marketing and farm finance and the remainder for building up the library in these fields.

West Virginia University and Station.—A West Virginia Forest Research Council, composed of representatives of Federal and State agencies and wood-using industries, and members of the forestry faculty of the College of Agriculture, has been organized.

R. A. Olney, associate professor of rural organization, has accepted a position as assistant professor of rural education at Cornell University. Carlton F. Taylor has been appointed assistant plant pathologist. Gerald Jenny, editor for the University and station, has been designated as director of University broadcasting.

Wisconsin University and Station.—George C. Humphrey, continuously associated with the animal husbandry work since 1901, has been relieved of the chairmanship of the department to give full time to certain phases of livestock work in which he is especially interested. Albert E. Darlow, associate professor of animal husbandry, has been appointed chairman of the department, the work of which has been reorganized to include all research, resident teaching, and extension work in sheep, swine, beef cattle, and horse husbandry. Gus Bohstedt, professor of animal husbandry, has been placed in charge of the livestock research.

A new department of dairy husbandry has been established in charge of Dr. Edwin E. Heizer, assistant professor of animal husbandry in the Ohio State University.

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EXPERIMENT STATION RECORD

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HOW THE EXPERIMENT STATIONS ARE AIDING LOW-INCOME FARMERS

The problems of low-income farmers and their families are receiving much consideration by the experiment stations at this time. Carefully planned and well-coordinated research programs, based directly on the immediate needs of the group, are resulting in distinct progress under difficult conditions and at very moderate cost.

The validity of these conclusions was strongly attested at the recent annual meeting of the Southeastern Experiment Station Directors' Conference. This group, formed about 8 years ago as an informal organization to promote cooperation and coordination of effort in the experimental work of the participating institutions, met for a conference in Louisiana in which the needs of the low-income class of the farm population received special attention. Following the usual procedure of these summer meetings, the directors and others in attendance made a rather intensive study of agricultural conditions in the various sections of Louisiana, visiting the branch experiment stations and other field headquarters for experimental work, giving special scrutiny to the scope of their programs and the adequacy of the methods employed, and attempting some evaluation of the results already secured and those which might reasonably be expected in the future.

One of the earliest impressions to be received was that of the uniqueness of this type of work and the consequent necessity not only for a thorough knowledge of the local conditions but for the organizing of experimental work to remedy the difficulties on the basis of this knowledge. It has been found that practices carefully worked out and suitable elsewhere are not always automatically adaptable to a new condition. What would be regarded as a routine expenditure elsewhere might be prohibitive for producers operating on a very modest scale. Too much technical skill might be expected of farmers and farm women of this class. Actual test has shown that attempts at diversification of crops, even for home consumption, in this area often meet with unexpected complications such as an exceedingly acid soil and an uncertain water supply. Frequently, the

ramifications are far-reaching. Strawberry production for market, which in the aggregate is a rather large enterprise, has been successfully built up, mainly out of small-scale activities, yet under the circumstances it doubtless would have proved of lesser importance if the study of cultural problems had not been supplemented by assistance in organizing cooperative marketing procedures.

Fortunately, these and many other difficulties of the small farmer have been recognized and avoided or corrected. Without sacrifice of scientific ideals, research projects have been drawn up and put into operation which are meeting the specific conditions closely and consequently are proving successful in providing much-needed and practical solutions within a reasonable time.

Another characteristic, particularly of the field work at the branch stations, has been its extensive and effective prosecution at relatively low cost. This work is directed from the main station, and overhead has been kept down by the use of rather simple equipment and areas of land limited to the specific needs of the projects. This practice has not only proved economical in the use of research funds but has produced results which are the more convincing to the farmers concerned because more nearly approaching their own conditions.

An example of how this policy is carried out is afforded by a study of the maintenance of small dairy herds in high production on a no-grain ration with locally produced feeds and with equipment and practices in line with the character and scope of the individual small farm enterprise. This work is directed by the dairy husbandry department at the main station and is carried on at one of the branch stations, which serves as the field laboratory. It is proving effective and serviceable in that it is showing the principles and practices which must be followed in order to obtain a profit from a small herd of cattle with feeds most easily grown locally and with equipment within the range of the pocketbook of the small farmer concerned.

Another type of project under which much has been done to enhance the well-being of many rural homes in the region looks toward greater diversification of farm enterprises as an insurance of a more dependable food supply. Not infrequently the main cash crop is one which may and too often does fail completely, leaving the growers and their families in very serious economic straits for months to come. An obvious remedy is diversification, but the precise form it should take can often be determined only by a rather detailed study in which cultural phases are merely the beginning and methods of utilization, preservation, and storage are more vital and less commonly understood. Doubtless much of the success which the stations have attained in such situations is due to their working out and presenting a solution which is not only theoretically promising but practical and complete.

Full advantage is being taken of opportunities to supplement the work of the main station by effective use of the branch stations as field laboratories. The activities of the U. S. Department of Agriculture and other available agencies are also utilized on a fully cooperative basis. This has proved especially helpful in effectively spreading a limited amount of funds over as wide an area as possible, in speeding up the results, and in serving a maximum number of farm operators.

That the cooperative research program in the Southern States is bringing substantial returns at moderate cost seems apparent. In one case which the survey brought out, sweet potato growing had been seriously threatened by the onslaught of insect pests and plant diseases in an area normally producing a $7,000,000 crop each year. By a marshalling of all available forces in a well-coordinated and intensive study, these difficulties were overcome in less than three seasons of work. The estimated cost of the research was relatively very small.

Developments such as this are not always attainable, but they are not uncommon and may reasonably be cited in an appraisal of the economic value of this type of research. They also illustrate the readiness with which the station's resources may be mobilized in time of emergency. This flexibility has always been one of the outstanding characteristics of these institutions, as was impressively demonstrated in the World War. It is an asset of great potential value to the Nation.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

[**Chemical work at the Hawaii Station**] (*Hawaii Sta. Rpt. 1937, pp. 49–59, fig. 1*).—The report notes work on a method for thallium determination in rat baits, by [T.] Togashi, [E. T.] Watanabe, and L. A. Dean; the hydrocyanic acid content of Hawaiian-grown cassava, by Dean; taro processing for flour and beverage powder, by G. J. Ley, J. H. Payne, and D. W. Edwards; sterols of avocado, kukui nut, Chinawood, chaulmoogra, and coconut oils, by L. N. Bilger and M. Westgate; iodine contents of Hawaiian meats and poultry, by E. M. Bilger; and preparation and properties of papain and bromelin, by Balls, R. R. Thompson, and W. W. Jones.

[**Chemical and bacteriological research at the Iowa Station**] (*Iowa Sta. Rpt. 1937, pt. 2, pp. 60–69, 72, fig. 1*).—The following projects are briefly reported upon: Certain chemical and physical characteristics of corn as these relate to fractionation and distribution of the corn protein, characterization of the starch, carbohydrate content of various farm crops, and oxidation of cornstarch, all by R. M. Hixon; identification of the water-soluble and the acid-hydrolyzable carbohydrate constituents (hemicelluloses) of the cornstalk and the development of methods for their analysis, by W. G. Gaessler and Hixon; a characterization of the products of starch degradation by enzyme, by N. M. Naylor; physical properties of dextrose, by J. H. Buchanan; utilization of agricultural products in the fermentative production of lactic acid, by C. H. Werkman; and factors influencing the utilization of dextrose in commercial canning and preserving of fruits and vegetables, by Buchanan and W. F. Coover.

[**Chemical methods**] (*Kentucky Sta. Rpt. 1937, pt. 1, pp. 39, 40, 41*).—These include a rapid method for determining carbon in carbohydrate and protein compounds in plant tissue and the application of the chlorate method for determining nitrogen to light, fluffy materials.

[**Chemical and bacteriological investigations at the Massachusetts Station**] (*Massachusetts Sta. Bul. 347 (1938), pp. 27, 37, 38, 39, 41, 74, 96*).—The influence of bile and bile salts on *Aerobacter aerogenes* is reported upon by J. E. Fuller; the effect of bacteriophage on *Escherichia coli*, by A. Bondi, Jr., and Fuller; a study of the Eijkman test, by R. L. France; methods for determining zinc and vitamin C; hemicelluloses of tobacco stalks, the effect of storage and processing on the carbohydrates of some varieties of edible onions, and lignin and its relation to the absorption of minerals by plants, all by E. Bennett; physical and chemical properties of mosaic viruses, by M. E. Freeman; canned baked apples and cider champagne and other bottled apple beverages, by C. R. Fellers, A. S. Levine, J. A. Clague, and W. B. Esselen, Jr.; currant jelly, by J. Novick and Fellers; and acid production by the *Escherichia-Aerobacter* group of bacteria as indicated by dissolved metallic iron, by A. V. Syrocki, Fuller, and France.

[**Chemical investigations of the Nebraska Station**] (*Nebraska Sta. Rpt. [1937], pp. 9, 10, 11*).—Data are included on the preparation and study of the cereal glutelins and physicochemical studies on the nature of cold resistance in crop plants.

The chemistry of plant constituents, O. GISVOLD and C. H. ROGERS (*Minneapolis, Minn.: Burgess Pub. Co., 1938, pp.* [2]+*X*+*309*).—This book "treats of the chemistry of plant constituents and some of the theories advanced to explain their formations. . . . Also, attention is directed to certain organic reactions that may either be involved in the formation of plant constituents or aid in characterizing and proving the structures of these products of plant life."

The chapter headings are: Introduction, carbohydrates, vegetable fats, plant and insect waxes, phytosterols, proteins, alkaloids, glycosides, the anthocyanins and anthoxanthines, carotenoids, tannins, terpenes and oxygenated terpenes, vitamins, enzymes, and products of fermentation.

The rôle of specificity in the enzymatic synthesis of proteins: Syntheses with intracellular enzymes, M. BERGMANN and H. FRAENKEL-CONRAT (*Jour. Biol. Chem., 119 (1937), No. 2, pp. 707–720, figs. 2*).—Peptide linkages of amino acids with aniline and with phenylhydrazine were brought about by papain, bromelin, and cathepsin. A study of the reactions and of the conditions under which they could be made to take place led the authors to the conclusion that "it now becomes probable that the processes of protein synthesis and protein hydrolysis may occur in vivo under identical physicochemical conditions and often simultaneously. Furthermore, protein synthesis in vivo must not necessarily proceed in such a way that one amino acid residue after another is attached to the rudimentary molecule of the protein under construction. One must consider also the alternative that the enzyme has at its disposal a number of protein fragments of different size and structure and subjects these fragments to a series of transformations until there is produced a protein pattern which is stable in the presence of the individual enzyme. Thus, the available protein fragments and the specificity of the enzyme together may determine the individual pattern of the synthesized protein."

On the separation and characterization of the proteins of egg white, E. G. YOUNG (*Jour. Biol. Chem., 120 (1937), No. 1, pp. 1–9; abs. in Chem. Abs., 31 (1937), No. 22, p. 8551*).—The proteins of the white of hen's egg have been separated by two procedures.

Osmotic pressure, molecular weight, and stability of amandin and excelsin and certain other proteins, N. F. BURK (*Jour. Biol. Chem., 120 (1937), No. 1, pp. 63–83, figs. 2; abs. in Chem. Abs., 31 (1937), No. 22, p. 8551*).—The results obtained are explained by assuming cystine to exist in proteins in two types of structure, a straight chain form and a cyclic form.

The synthesis of hexocystine and hexomethionine and a study of their physiological availability, C. B. JONES and V. DU VIGNEAUD (*Jour. Biol. Chem., 120 (1937), No. 1, pp. 11–20, figs. 2; abs. in Chem. Abs., 32 (1938), No. 1, p. 113*).—The synthesis of the disulfide of the 6-carbon homologue of cysteine, bis-ε-amino-ε-carboxypentyl disulfide, and of the second higher homologue of methionine, ε-methylthiol-α-aminocaproic acid is described.

The glutamic acid-pyrrolidonecarboxylic acid system, H. WILSON and R. K. CANNAN (*Jour. Biol. Chem., 119 (1937), No. 1, pp. 309–331, figs. 2; abs. in Chem. Abs., 31 (1937), No. 17, p. 6089*).—Equilibrium and velocity constants are reported.

Relations of thiourea, cysteine, and the corresponding disulfides, G. TOENNIES (*Jour. Biol. Chem., 120 (1937), No. 1, pp. 297–313, figs. 3; abs. in Chem. Abs., 31 (1937), No. 21, p. 7849*).—The author has demonstrated the metathesis of dithioformamidine and cysteine to thiourea and S-(guanylthio-)cysteine.

The formation of dopa by the exposure of tyrosine solutions to ultraviolet radiation, L. E. ARNOW. (Univ. Minn.). (*Jour. Biol. Chem., 120 (1937), No. 1, pp. 151–153, figs. 2*).—The author found that *l*-3,4-dihydroxyphenyla-

lanine is formed from tyrosine under the influence of ultraviolet light in the presence of air. The destruction of tyrosine did not occur in the absence of air. Some destruction occurred through glass filters, but the destruction was much more marked when quartz filters were used. All the solutions irradiated assumed a reddish-brown color. No aldehyde was formed, negative tests being obtained with the Schiff reagent. All irradiated solutions gave faintly positive tests with the Nessler reagent. The results "suggest that one of the mechanisms whereby radiant energy causes increased melanin formation in the skin is the production of dopa from tyrosine, the dopa then being converted to melanin by the dopa oxidase of the melanoblasts."

Barley and malt studies, J. G. Dickson, H. L. Shands, A. D. Dickson, and B. A. Burkhart. (Univ. Wis. and U. S. D. A.). (*Brewers Tech. Rev., 11 (1936), No. 3, pp. 79–82, figs. 4*).—The authors have designed experimental malting equipment for samples of from 15 to 20 lb. of barley. The malting chamber is essentially similar in general principles to a compartment malt house. The 24 individual compartments are placed in hoppers in the malting chamber. Air temperature and moisture content of the air are controlled by a thermostated cooling unit and water sprays. The temperature is held at about 15°–16° C. The moisture content of the air is maintained slightly below the saturation point. The tempered air is drawn through each compartment at a rate which insures uniformity in temperature throughout the barley mass during the germination period. The most suitable procedure for the comparative malting of the barley samples is briefly outlined.

A special slide rule for rapid calculation of time for the wheat meal fermentation time test, W. W. Worzella and C. B. Juday. (Ind. Expt. Sta.). (*Jour. Amer. Soc. Agron., 28 (1936), No. 3, pp. 255, 256, fig. 1*).—The authors describe "A" and "B" scales for a slide rule by means of which the number of minutes included between any two clock-scale points is indicated. For this purpose both scales are linear, the A being a scale of minutes from 0 to 720, the B a scale of hours and minutes from 12 to 12 as in the 12-hr. clock face.

Wheat—its proteins and nutritional properties, D. B. Jones (*Cereal Chem., 14 (1937), No. 6, pp. 771–782, figs. 2*).—The author reviews the amino acid composition and nutritive properties of the different types of protein present in the wheat kernel, and reports the findings of M. J. Horn on the cystine and methionine content of whole wheat and patent flour and of the isolated proteins of wheat.

Soya phosphatides, A. A. Horvath. (Del. Expt. Sta.). (*Jour. Chem. Ed., 14 (1937), No. 9, pp. 424–426*).—The author discusses the content of the phosphatides lecithin and cephalin in soybeans and the process of their extraction. Some of the uses of the soy phosphatides are noted.

Behavior of butyric acid-butyl alcohol bacteria toward acetylmethylcarbinol and asparagin, R. W. Brown, G. L. Stahly, and C. H. Werkman. (Iowa Expt. Sta.). (*Iowa State Col. Jour. Sci., 12 (1938), No. 2, pp. 245–251*).—The authors find that the butyric acid-butyl alcohol group of bacteria may be subdivided into two sections on the basis of their behavior toward acetylmethylcarbinol: (1) Those forming the carbinol but failing to reduce it to 2,3-butylene glycol (*Clostridium acetobutylicum* and *C. felsineum*) and (2) those reducing the added carbinol to 2,3-butylene glycol.

Addition of asparagine to a corn-mash medium diverted the fermentation to form large yields of butyl alcohol in place of butyric acid. Yeast extract and peptone exerted a similar effect. The effect of asparagine proved to be proportional to its concentration and is apparently specific for *C. butylicum*, since it was not observed with any but the isopropyl alcohol-forming organism.

Dissimilation of intermediary compounds in the butyl-isopropyl alcohol fermentation, O. L. OSBURN, R. W. BROWN, and C. H. WERKMAN. (U. S. D. A. and Iowa Expt. Sta.). (*Iowa State Col. Jour. Sci., 12 (1938), No. 2, pp. 275–284, fig. 1*).—The authors have shown that butyric acid added to fermenting glucose is reduced to butyl alcohol. The presence of butyric acid in fermenting glucose solutions has a pronounced effect on the course of the fermentation reactions, leading to high yields of isopropyl alcohol from glucose.

Acetic acid is converted into isopropyl alcohol. Addition of acetic acid did not affect the yields of butyl alcohol. Acetaldehyde was converted into ethyl alcohol, with traces of acetylmethylcarbinol and 2,3-butylene glycol. Acetone was converted into isopropyl alcohol. Lactic acid was not fermented under any conditions. Pyruvic acid was converted to butyl and isopropyl alcohols when added to fermenting glucose. When fermented alone the sodium or calcium salt of pyruvic acid yielded a mixture of acetic and butyric acids.

Chemical reactions suggested by these observations and the data obtained are stated and discussed.

Gluconic acid production, A. J. MOYER, P. A. WELLS, J. J. STUBBS, H. T. HERRICK, and O. E. MAY. (U. S. D. A.). (*Indus. and Engin. Chem., 29 (1937), No. 7, pp. 777–781, figs. 4*).—In the use of submerged mold growths under increased air pressure in rotary drums an improvement of the inoculum was effected by the selection of a new fungus, *Aspergillus niger*, strain 67, which not only readily produces large quantities of spores but also effects a rapid fermentation; a second improvement by the germination of these spores under conditions which make possible economies in the amount of inoculum and decrease the fermentation period. The glucose concentration, proportion of calcium carbonate present, and nitrogen sources have a pronounced effect upon its duration.

The electrical conductivity of cod liver oil, L. W. BUTLER and J. W. WOODROW. (Iowa State Col.). (*Iowa State Col. Jour. Sci., 11 (1937), No. 4, pp. 333–342, figs. 3*).—The specific resistance of cod-liver oil at room temperature was found to be of the order of 2×10^{11} ohm-cm, but this value depends upon the previous treatment of the oil. It was also shown to increase to about 2×10^{13} ohm-cm at 0° C. and to drop to about 2×10^{10} ohm-cm at 90°.

The resistance varies with the temperature, in all cases decreasing with increase of temperature. There is a logarithmic relation between resistance and temperature over a considerable range in temperature. The changes in slope of the logarithmic graphs do not always occur at the same temperature and are not always in the same direction. The resistance becomes very unstable at temperatures between 80° and 90° and is permanently decreased when heated to those high temperatures. There is, however, no permanent change due to lowering the temperature to −5°.

The resistance of the oil was shown further to depend upon the exposure to air, decreasing with slight aeration, then upon further aeration increasing to as much as three or four times its original value and eventually decreasing again to its original value or even slightly below this.

The conductivity was not altered by quartz-transmitted ultraviolet light, and the resistance was not definitely related to the vitamin content of the oil and was independent of the voltage.

A polyuronide from tobacco stalks, E. BENNETT. (Mass. Expt. Sta.). (*Indus. and Engin. Chem., 29 (1937), No. 8, p. 933*).—The isolation and partial analysis of a polyuronide from the cured stripped stalk of Havana seed tobacco is described. Upon hydrolysis the polyuronide yields xylose as the chief sugar.

Recent advances in the field of vitamin chemistry, L. L. RUSOFF. (Fla. Expt. Sta.). (*Fla. Acad. Sci. Proc., 1 (1936), pp. 42–47*).—The author reviews the chemistry of the vitamins A, B_1, C, D, E, and G (B_2), which have been isolated in C. P. form, and presents chemical formulas for all but vitamin E, for which one has not yet been assigned.

On the occurrence and constitution of the 693 mμ chromogen (vitamin A_2?) of fish liver oils, A. E. GILLAM, I. M. HEILBRON, W. E. JONES, and E. LEDERER (*Biochem. Jour., 32 (1938), No. 2, pp. 405–416, figs. 2*).—In continuation of a study previously noted from a preliminary report (E. S. R., 78, p. 890), and with the assistance of V. Rosanova, the occurrence of the 693 mμ chromogen, "vitamin A_2," was determined by spectrophotometric analysis in the liver oils and vitamin A concentrates of Russian fresh-water and marine fish. The biological activity of the liver concentrates was determined by comparative feeding tests with rats. With the assistance of J. W. Batty and J. H. Beynon, the authors concentrated the 693 mμ chromogen and studied its properties.

The ultraviolet absorption spectra of the fresh-water fish-liver oil and vitamin A concentrates showed an absorption maximum in alcohol between 340 and 350 mμ and with stannous chloride in chloroform gave a blue color with bands at 693 and 610 to 620 mμ, with relative intensities ranging from 0.5 to 2.5, while the extracts from the marine fish showed absorption maximum values in alcohol between 325 and 328 mμ, and with stannous chloride in chloroform the bands were at 693 and 620 mμ and the relative intensities were 0.15:1. The results of the biological tests indicate that the 693 mμ chromogen is vitamin A active, since the fresh-water fish extract possessed more activity than could be accounted for by the vitamin A present.

By ozonolysis of a solution of the fresh-water fish concentrate containing the 696 mμ chromogen it is believed to be the C_{22} homologue of vitamin A ($C_{22}H_{32}O$) with 6 ethylenic linkages.

Vitamin A content of cod liver oil: A comparison of spectrophotometric and chemical methods, A. D. HOLMES, F. TRIPP, and G. H. SATTERFIELD (*Indus. and Engin. Chem., Analyt. Ed., 9 (1937), No. 10, pp. 456, 457*).—The results obtained in the determination of the vitamin A potency of 32 samples of medicinal cod-liver oil by the British Pharmacopoeia method giving antimony trichloride blue values and by the Hilger vitameter method giving extinction coefficient or E values are compared, with the conclusion that the two methods may be expected to give results of the same order. The range in ratios of blue value: E value was from 0.60:1 to 13.1:1, with 20 of the samples falling within a range of from 9.0:1 to 11.0:1.

No direct relationship could be established between the fatty acid content of an oil and the amount of red or yellow color produced by the action of the antimony trichloride solution on the oil or between the free fatty acid content or unsaponifiable material present in the oil and the vitamin A potency.

The use of synthetic zeolites in the isolation of vitamin B_1, I–III (*Jour Amer. Chem. Soc., 59 (1937), No. 9, pp. 1617–1622*).—Three papers are presented

I. *Experiments with rice polishings*, L. R. Cerecedo and D. J. Hennessy (pp 1617–1619.)—The authors describe in detail a method for isolating vitamin B hydrochloride by the use of a synthetic zeolite in place of the silicates such a acid clays and fuller's earth.

II. *Experiments with brewers' yeast*, L. R. Cerecedo and F. J. Kaszuba (pp 1619–1621).—A method is described for isolating vitamin B_1 hydrochloride fror brewers' yeast.

III. *Experiments with wheat germ*, L. R. Cerecedo and J. J. Thornton (p[illegible] ... of vitamin B_1 from wheat germ is described in detai[illegible]

Crystalline vitamin B₆, A. Ichiba and K. Michi (*Inst. Phys. and Chem. Res.* [*Tokyo*], *Sci. Papers*, *34* (*1938*), *No. 792*, *pp. 623–626*, *figs. 3*).—A method is described for the isolation of vitamin B_6 from an alcoholic extract of rice polishings by treatment with lead acetate at pH 5 and again at pH 8 and removal of the lead by hydrogen sulfide, adsorption of the filtrate with acid clay at pH 2.5–4, and elution with 0.1 N barium hydroxide solution. After a second adsorption with animal charcoal, followed by elution with alcohol and with ammoniacal aqueous acetone, the acetone eluate is concentrated to a sirup in vacuo, the inert matter is removed by alcoholic extraction, and the alcoholic extract is treated with a saturated alcoholic solution of mercuric chloride to recover the active substance in solution. The solution is concentrated, freed from mercury, and the crystalline mixture is washed with ether and acetone and fractionated with alcohol. The alcoholic eluate of the charcoal adsorbate is treated similarly to remove the remaining potent substance.

The crystalline vitamin B_6 was tested by bio-assay on rats receiving a vitamin B complex-deficient diet supplemented by 20γ vitamin B_1, with 40γ crystalline lactoflavine and 0.5 mg nicotinic acid, or with 10 percent egg-white powder free from vitamin B_6 substituted for the same amount of alcohol-treated fish protein in the diet. After the typical dermatitis had developed, vitamin B_6 crystals were given and the dermatitis was cured and growth restored. It is noted that the rats receiving lactoflavine did not show as good a growth response, indicating that the egg-white powder contained an additional factor.

Crystalline vitamin B–6, J. C. Keresztesy and J. R. Stevens (*Soc. Expt. Biol. and Med. Proc.*, *38* (*1938*), *No. 1*, *pp. 64*, *65*).—The authors report that the administration to rats on a vitamin B_6-deficient diet of a single 0.1-mg dose of a crystalline hydrochloride of a nitrogen base isolated from rice bran produced healing of the pellagra symptoms within 14 days.

Vitamin B–6, J. C. Keresztesy and J. R. Stevens (*Jour. Amer. Chem. Soc.*, *60* (*1938*), *No. 5*, *pp. 1267*, *1268*).—In this report the formula of the vitamin B_6 hydrochloride isolated from rice bran, as noted in the above study, is shown to be $C_8H_{11}NO_3.HCl$. The vitamin gives a reddish-brown color with ferric chloride, and in the pure state is stable to concentrated hydrochloric acid at elevated temperatures and is not affected by heating with alkalies, nitrous acid, ethyl nitrate, or Fehling's solution. The absorption bands shown by the vitamin lie within the spectral region of from 2,300 to 3,300 a. u.

Estimation of riboflavin: A simple fluorescent method, S. M. Weisberg and I. Levin (*Indus. and Engin. Chem.*, *Analyt. Ed.*, *9* (*1937*), *No. 11*, *pp. 523*, *524*, *figs. 3*).—The method of estimating riboflavine by means of its fluorescence under ultraviolet radiation, as previously described by Supplee et al. (E. S. R., 76, p. 295), has been further simplified. The fluorescence of various dilutions of the unknown aqueous solution containing from 0.1γ to 1γ of riboflavine per cubic centimeter as the only fluorescing agent is compared under ultraviolet light with the standard containing sodium fluorescein and made up in terms of from 0.1γ to 1γ of riboflavine per cubic centimeter. Due to the high intensity of the fluorescence and the green component of the sodium fluorescein, concentrations higher than 1γ are difficult to match.

Anaerobic ultrafiltration, P. H. Lavietes (*Jour. Biol. Chem.*, *120* (*1937*), *No. 1*, *pp. 267–275*, *figs. 3*).—A method has been devised for ultrafiltration of small amounts of serum without exposure to air. The serum is introduced over mercury, pressure is applied with a column of mercury, and filtration proceeds across a cellophone membrane, the ultrafiltrate displacing mercury from the receiving chamber. It is pointed out that cellophane possesses the advantages, as compared with collodion membranes, of greater strength, uniformity, and

ability to dry completely without harm, thus avoiding dilution of the serum. It was experimentally shown that no significant loss of carbon dioxide, glucose, or protein occurs during the process.

The determination of nitrogen by modified Kjeldahl methods, W. R. CAMPBELL and M. I. HANNA (*Jour. Biol. Chem., 119 (1937), No. 1, pp. 1–7*).—The authors have shown that when selenium dioxide (1 g per 100 cc) is added to a 3:1 mixture of sulfuric and phosphoric acids containing copper (1 g $CuSo_4.5H_2O$ per 100 cc), a rapid and effective agent for digesting nitrogenous matter is produced.

The determination of bromine in biological substances, P. S. WINNEK and A. H. SMITH (*Jour. Biol. Chem., 119 (1937), No. 1, pp. 93–101*).—The authors have determined certain sources of error in the determination of bromine by alkaline fusion, extraction of the bromides with alcohol, and iodometric titration after oxidation to bromate. Losses due to smoking during the heating with alkali could be avoided, with much saving of time, by the use of overhead electric heating units. Extraction of the bromides with alcohol was found to be quantitative, but a further heating at 480° C. for 2 min. after the evaporation of the alcohol was needed to eliminate traces of organic matter which prevented complete oxidation of the bromide to bromate. With suitable modification the method was made to yield accurate results in the determination of from 1γ or 2γ up to 800γ of bromine, the bromine contents of a considerable variety of common foodstuffs being given.

A method for the quick dry ashing of blood plasma and whole blood for the determination of chlorides, W. E. WILKINS and H. D. JONES (*Jour. Biol. Chem., 117 (1937), No. 2, pp. 481–484; abs. in Chem. Abs., 31 (1937), No. 7, p. 2245*).—The authors describe a titration technic.

The photoelectric determination of potassium in minute quantities of serum, W. S. HOFFMAN (*Jour. Biol. Chem., 120 (1937), No. 1, pp. 57–61, fig. 1; abs. in Chem. Abs., 31 (1937), No. 22, p. 8583*).—A method has been adapted for photoelectric colorimetry use.

Intensity and stability of ferric thiocyanate color developed in 2-methoxyethanol, H. W. WINSOR (Fla. Expt. Sta.). (*Indus. and Engin. Chem., Analyt. Ed., 9 (1937), No. 10, pp. 453–455*).—The author reports the preparation of a solvent, consisting of 10 g of ammonium thiocyanate dissolved in sufficient 2-methoxyethanol to make 250 cc, which is a satisfactory medium for the development and colorimetric comparison of the ferric thiocyanate color produced in the presence of minute amounts of iron in biological materials. The 2-methoxyethanol has the relatively low dielectric constant of 12 as compared to 80 for water and, therefore, the amount of color lost through dissociation is very small. The intensity of the color developed is about 85 percent deeper than in water and 27 percent deeper than in a mixture of 10 g of ammonium thiocyanate in 45 cc of water and 200 cc of acetone. Due to the high boiling point of the reagent (124.3° C.), no loss in volume occurs during analysis, and after from 24 to 47 hours' standing at room temperature in the open test tube, the color loss due to evaporation is 96 percent less than in the acetone solution. In optical clarity the reagent solution conforms to Beer's law. The 2-methoxyethanol can be rendered iron-free by one distillation through glass and is colorless, practically odorless, and very economical. The reagent is subject to photochemical change when exposed to the light.

The applicability of the Benedict-Denis procedure to the determination of methionine sulfur, C. B. RUTENBER and J. C. ANDREWS (*Jour. Biol. Chem., 120 (1937), No. 1, pp. 203–207; abs. in Chem. Abs., 31 (1937), No. 22, p. 8584*).—It is shown that in the determination of sulfur in methionine, the use of

the Benedict-Denis reagent produces low results, averaging about 79 percent of theory, although theoretical values were obtained on pure cystine.

Sulfites as protein precipitants, W. R. CAMPBELL and M. I. HANNA (*Jour. Biol. Chem., 119 (1937), No. 1, pp. 9–14*).—The authors found a considerable number of sulfites capable of the more or less incomplete precipitation of serum proteins, including ammonium sulfite, ammonium bisulfite, and a saturated solution of potassium sulfite. The normal sodium sulfite, however, is deemed the most satisfactory for use with the proteins of blood plasma.

A rapid photoelectric method for the determination of glucose in blood and urine, W. S. HOFFMAN (*Jour. Biol. Chem., 120 (1937), No. 1, pp. 51–55, fig. 1; abs. in Chem. Abs., 31 (1937), No. 22, p. 8583*).—A simple and rapid method is described.

Determination of fermentable blood sugar by gasometric measurement of the carbon dioxide formed by the action of yeast, R. F. HOLDEN, JR. (*Jour. Biol. Chem., 119 (1937), No. 1, pp. 347–368; abs. in Chem. Abs., 31 (1937), No. 16, p. 5831*).—A method for the direct estimation of fermentable blood sugar, which is measured by the CO_2 produced by yeast in the manometric apparatus of Van Slyke and Neill (E. S. R., 69, p. 172), is described.

Methods for determining pentoses as furfural in citrus fruits, W. B. SINCLAIR and E. T. BARTHOLOMEW. (Calif. Citrus Expt. Sta.). (*Amer. Jour. Bot., 22 (1935), No. 10, pp. 829–842, fig. 1*).—Practically theoretical yields were obtained from known samples of furfural by the bromate method. Theoretical yields of pentoses as furfural were not obtained from *d*-xylose and *l*-arabinose however, and steam distillation did not appear to produce higher yields of furfural than ordinary distillation. In the testing of citrus fruit tissues and juice, substances other than furfural came over in the distillation process and subsequently reacted with the bromine, thus causing erroneous values with the bromate method, but these substances were extracted from the tissue with 95 percent ethyl alcohol and ethyl ether, after which comparable results were obtained by the phloroglucinol and the bromate methods, the latter procedure yielding slightly higher values.

The average percentage of furfural obtained from healthy, mature Valencia orange peel by the bromate method was 15.86 percent, and by the phloroglucinol method 14.98 percent by ordinary distillation. The same methods gave 15.81 and 14.71 percent, respectively, by steam distillation. The average percentage of furfural obtained from healthy, mature Valencia orange juice sacs (minus juice) by the bromate method was 14.46 percent and by the phloroglucinol method 12.84 percent. Similar tests on navel orange juice sacs gave 12.88 and 11.75 percent, respectively. Lemon peel showed an average yield of 17.45 percent of furfural by the bromate method and 16.55 percent by the phloroglucinol method.

Fractionation of oat hull lignin, W. S. CLAUS and R. M. HIXON. (Iowa State Col.). (*Iowa State Col. Jour. Sci., 12 (1938), No. 2, pp. 205–209*).—The authors found an ammonia-lignin complex which they prepared from oat hulls to be separable into two fractions according to solubility in acetone. This solvent condenses with the iodocarboxylignin, obtained by treatment with alkaline hypoiodide solutions. They further found that "as the alkaline iodine oxidation is carried to completion, the structure of the lignin molecule is so modified that methylation with diazomethane and dimethyl sulfate give approximately the same methoxyl content. The acetone insoluble fraction of ammonia lignin methylates to the same extent with diazomethane as with dimethyl sulfate."

A precise method for the determination of coumarin, melilotic acid, and coumaric acid in plant tissue, W. L. ROBERTS and K. P. LINK. (Wis.

Expt. Sta.). (*Jour. Biol. Chem., 119 (1937), No. 1, pp. 269–281*).—This colorimetric method for the determination of coumarin, melilotic acid, and coumaric acid in small amounts of sweetclover tissue, and accurate for the range in which these constituents occur, is based on the principle of first extracting the components from the green tissue or seeds with acidulated aqueous acetone (10 percent). After each component has been separated from the crude extraction mixture, through the use of a selective solvent, it is coupled with a diazonium solution prepared from *p*-nitraniline. The coupling procedure produces a red dye which lends itself to a colorimetric estimation in an ordinary colorimeter. The color comparisons are made against known standards produced by coupling the pure substances with the diazonium reagent. Summarized tabulations showing the performance of the method with varying amounts of pure coumarin, melilotic acid, and coumaric acid in admixture with each other and when added to alfalfa tissue as control are given. The analyses of various species of sweetclover and alfalfa tissue for these compounds are presented. It is shown that the method can be employed to differentiate between so-called bitter and nonbitter species of *Melilotus* on the basis of their coumarin, melilotic acid, and coumaric acid content.

A chromogenic tungstate and its use in the determination of the uric acid of blood, E. B. Newton. (Cornell Univ.). (*Jour. Biol. Chem., 120 (1937), No. 1, pp. 315–329*).—The preparation of a new salt of a highly chromogenic arsenotungstate is described. A method in which this compound is used as a reagent in determining the uric acid of blood is outlined and its advantages discussed. It is shown to be necessary to separate uric acid from other reactive substances in blood filtrates. The possibility of adopting the new reagent as the reactive chromogenic agent in determining uric acid of urine, ascorbic acid, cystine, glutathione, and thioneine is pointed out.

A micromethod for the determination of gelatin and a study of the collagen content of muscles from normal and dystrophic rabbits, H. C. Spencer, S. Morgulis, and V. M. Wilder. (Univ. Nebr.). (*Jour. Biol. Chem., 120 (1937), No. 1, pp. 257–266*).—This method for the microdetermination of collagen as gelatin nitrogen depends upon the conversion of collagen to gelatin by autoclaving from 100 to 200 mg of substance dried by means of acetone. The gelatin is precipitated by means of tannic acid. The precipitate is dissolved in dilute alkali and digested with sulfuric acid and hydrogen peroxide. The digest is made up to a known volume and aliquot portions are directly nesslerized. The quantities are to be so adjusted that the aliquots contain from 0.5 to 1 mg of nitrogen. Results of determinations of the collagen content of the muscle material named are recorded.

A photo-electric Tyndall meter, W. S. Mueller. (Mass. Expt. Sta.). (*Food Res., 2 (1937), No. 1, pp. 51–54, figs. 2*).—The instrument here described was developed for the purpose of studying the effect of temperature treatments on the light-scattering ability of gelatin sols and gels, where a need was felt for an instrument extremely sensitive to light intensity. Control of the temperature of the chamber in which is placed the solution to be examined is provided. Two photoelectric cells are used, one receiving the light from the sample at right angles to the axis of the illuminating beam, the other being illuminated directly by a beam passing from the same source through a collimator lens and two Nicol prisms, the one set and the other movable through an angle of 90°. The Nicol prisms are so adjusted as to shut out all light when the dial reads 90° and to show maximum brightness when the dial reads 0°. This setting of the fixed Nicol prism then allows one to read the angle directly through which it is necessary to rotate the movable Nicol in order to equal a particular intensity of

Tyndall cone. The square of the cosine of this angle multiplied by 100 gives the "relative Tyndall intensity." A galvanometer is used as a null-point indicator.

Dextrose in the manufacture of fruit and vegetable products, C. R. Fellers, J. Miller, and T. Onsdorff. (Mass. and Oreg. Expt. Stas.). (*Indus. and Engin. Chem., 29 (1937), No. 8, pp. 946–949, fig. 1*).—As a rule crystalline dextrose can be used in most canned fruits and fruit products to the extent of from 20 to 40 percent of the total sugar added. In some cases an improved product resulted. Dextrose is deemed particularly suitable for use in sweet pickles and relishes, candies, and soda-fountain sirups.

Further data on the effect of SO_2 in preventing high volatile acidity in wines, W. V. Cruess. (Univ. Calif.). (*Fruit Prod. Jour. and Amer. Vinegar Indus., 15 (1936), No. 11, pp. 324–327, 345*).—The correct use of sulfur dioxide was found to be one of the most important factors in preventing excessive volatile acidity in wines. Data from 1934 and 1935 vintages with and without sulfur dioxide treatment show the volatile acidity to have been about three times as great in the absence of the preservative. In storage sulfur dioxide "should be maintained at a safe level, probably 60–75 p. p. m." A number of specified precautions against contamination are also essential, but the author is convinced that the proper use of SO_2 is one of the most important if not the most important one that is applied under Californian conditions.

AGRICULTURAL METEOROLOGY

Indices in agricultural climatology, J. A. Prescott (*Jour. Austral. Inst. Agr. Sci., 4 (1938), No. 1, pp. 33–40*).—The purpose of this study was to find "some suitable expression which will convey in a single formula and without undue qualification the climatic conditions of a given environment . . . [more particularly] finding an expression relating rainfall to evaporation which will closely approximate to the agricultural value of the rainfall under all conditions of temperature and atmospheric humidity." Three methods of approach were studied and are discussed: (1) Subtracting the evaporation from the rainfall, (2) comparing simple ratios of rainfall to evaporation or to some such factor as a saturation deficit or a function of temperature related to evaporation, and (3) relationships between rainfall and temperature required to maintain certain specified soil conditions, as proposed by Crowther.[1] It is stated that "the combination of the meteorological monthly normals of rainfall, temperature, and saturation deficiency into various indices is of considerable interest to the student of comparative climatology who is interested primarily in atmospheric or in soil moisture. It is possibly a little too early to expect the discovery of a single index which will be of universal application. For the present it appears to be the wisest plan to examine each problem of bioclimatology or agroclimatology on its own merits and to determine the most suitable index to meet each particular need as it arises."

Physical interpretation of the weather, E. W. Woolard (*Jour. Appl. Phys., 9 (1938), No. 1, pp. 5–15, figs. 12; abs. in Science, 87 (1938), No. 2251, Sup., p. 11*).—Summing up the progress and present status of weather forecasting, the author says: "For a long time to come . . . weather forecasting must continue to be a combination of physical reasoning with methods based on accumulated practical experience with synoptic charts. We cannot yet, and perhaps may never, safely do without the empirical judgment of the experienced forecaster." However, the newer methods of studying weather by air-mass analysis and the like are stated to be adding to the accuracy and dependability of forecasts.

[1] Roy. Soc. [London], Proc., Ser. B, 107 (1930), No. B 748, pp. 1–30, fig. 1.

Moreover, the new methods will have "the distinct advantage of making weather forecasting less of an esoteric art, irrespective of the extent to which they may effect actual improvements over the results already obtainable by empirical practices."

The importance of observations from the upper atmosphere in long range weather forecasting, H. C. WILLETT (*Jour. Appl. Phys., 8 (1937), No. 12, pp. 807–814, figs. 2; abs. in Sci. Abs., Sect. A—Phys., 41 (1938), No. 482, pp. 136, 137*).—This article deals with the statistical and the synoptic methods of long range weather forecasting. The former is considered of doubtful value, and more data for the upper atmosphere are considered to be needed in the latter method. It is stated that the results of the study encourage the belief that it should eventually be possible to gain sufficient understanding of the controlling factors of weather changes so that meteorological conditions may be reliably forecast.

Practical study of radiation—solar, atmospheric, and terrestrial, C. MAURAIN (*Étude pratique des rayonnements solaire, atmosphérique et terrestre. Paris: Gauthier-Villars, 1937, pp. [4]+188+[1], figs. 18; abs. in Ann. Agron. [Paris], n. ser., 8 (1938), No. 1, pp. 137, 138*).—This presents some practical aspects and applications of results of studies, primarily by the author, with new or improved methods and apparatus at the Observatory of Saint-Maur, but taking into account also observations at other places. It deals with duration of sunshine, direct solar radiation, terrestrial radiation, light intensity and energy of radiation, heat and light as climatic factors, and other matters of interest to meteorologists and students of bioclimatics.

Evaporation and rainfall studies in the northwest Minnesota lake region, J. C. JENSEN (*Amer. Phil. Soc. Proc., 78 (1938), No. 4, pp. 651–670, figs. 4*).—Continuing previous studies (E. S. R., 76, p. 587), the author found wide variations of thunderstorm rainfall in stations only a few miles apart. "The large additional moisture content in the air on the lee side of lakes was again noted, and additional information obtained regarding the rate of evaporation by observation of several lakes. It is shown that the heat absorption resulting from 0.5 in. of evaporation per day is considerably more than the total incident solar radiation on the corresponding surface; therefore, it is evident that the presence of the lake will have a decided cooling effect in addition to adding to the moisture content of the atmosphere. Radiation falling on stubble and dry soil, on the other hand, is mostly reflected and thus raises the temperature of the surrounding air. This cooling effect of exposed water surface is one of the important contributions of the lakes and ponds which the author contends should be greatly increased in number."

The Ohio and Mississippi River floods of January–February 1937, B. SWENSON (*U. S. Mo. Weather Rev. Sup. 37 (1938), pp. IV+55, pls. 7, figs. 31*).—The author gives the detailed history and background of these floods with reference to the drainage basin of the Mississippi River (description of the Ohio Basin, history and classification of Ohio River floods, causes of the 1937 flood, the major storm period, factors contributing to the propagation of floods in the Ohio River, meteorology of January 1937 storms, typical storms producing Ohio River floods, crest stages in the 1937 flood, and the extent of flood loss and damage), floods in the lower Mississippi River (history, the possibility of a synchronized flood, and the flood of January-February 1937), relationship of the river gages at Memphis, Tenn., and flood forecasts and warnings.

Improvements in apparatus used in snow surveying (*Nevada Sta. Rpt. 1937, p. 30*).—A progress report is given.

British snowfall survey (*Nature [London], 141 (1938), No. 3561, p. 195*).—The International Snow Commission at a recent meeting emphasized especially

the importance of snowfall in the hilly districts of the British Isles and formulated general plans for extension of knowledge supplementing rainfall data already being obtained by the Meteorological Office.

Climatological data for the United States by sections, [1937] (*U. S. Dept. Agr., Weather Bur. Climat. Data, 24 (1937), No. 13, pp. [258], pls. 2, figs. 34*).—Summaries are given of climatological data for each month of 1937 and for the year as a whole for each State.

SOILS—FERTILIZERS

[Soil investigations by the Arizona Station] (*Arizona Sta. Rpt. 1937, pp. 4–7, 9, 10*).—The report notes work on soil conservation, including physical characteristics (E. S. R., 78, p. 15), nitrogen transformations, moisture equivalent, freezing-point data on puddled soils, conductivity determinations, and cohesion; erosibility; soil reaction; and lysimeter studies.

[Soil work of the Florida Station] (*Florida Sta. Rpt. 1937, pp. 63, 64, 66, 67, 68, 69, 127–129, 142, 143, 146, 156, 157, fig. 1*).—The station reports upon the determination of the effect of various potash carriers on the yield of citrus crops, and the effect of various fertilizer formulas on citrus and potatoes, both by R. W. Ruprecht; determination of the effect of green manures on the composition of the soil, by R. M. Barnette; the occurrence and behavior of zinc and other less abundant elements in soils, by O. E. Gall and Barnette; soil studies with celery, by E. R. Purvis and Ruprecht; nutrient salt concentration in the soil with special reference to the trace elements, by R. B. French; mineral content of collards and other vegetable crops with special reference to iron, by H. W. Winsor; a study of the so-called quick methods for determining soil fertility, by C. E. Bell; citrus soils investigations, by M. Peech; soil investigations in the Everglades, by J. R. Neller and R. E. Robertson; the role of special elements in plant development upon the peat and muck soils of the Everglades, by Neller, Robertson, and W. T. Foresee; composition of the soil air and the response of crops to phosphorus and chlorides, both by Neller; and the relation of the organic composition of sugarcane to the progress of vegetative development and the occurrence of maturity and the effect of sulfate v. muriate of potash on potatoes, both by Neller and Foresee.

[Soil work, Hawaii Station] (*Hawaii Sta. Rpt. 1937, pp. 45–48*).—The report discusses the technic for the determination of freezing point depressions, by H. A. Wadsworth; carbon content of Hawaiian soils, by [E. T.] Watanabe and L. A. Dean; soil colloid studies, by C. Lyman and Dean; and soil phosphorus studies, by Dean.

[Soil investigations by the Iowa Station] (*Iowa Sta. Rpt. 1937, pts. 1, pp. 72–79, 234, 235; 2, pp. 8–18, figs. 2*).—Part 1 of this report contains brief notes on the relative value of red clover, alfalfa, and sweetclover as soil-building crops, by P. E. Brown and L. W. Forman; occurrence and activities of *Azotobacter* in Iowa soils as influenced by soil treatment, utilization of carbonaceous materials by *Rhizobium*, effects on crop yields and soil conditions of small applications of fine limestone drilled in the row for starting new seedlings of legumes on acid soils, and occurrence and activities of legume bacteria in acid soils as influenced by soil treatment, all by Brown and D. W. Thorne; decomposition of lignin in soils, decomposition of leguminous green manures in acid and limed soils, and decomposition of some humus-forming materials in soils, all by F. B. Smith; relation between the capillary tension and moisture content of soil as determined by porous ceramic cells, relation of capillary conductivity to the capillary tension and moisture content of soil, and factors determining the flow

and distribution of water in soil and the development of field apparatus for soil moisture measurements, all by L. A. Richards; and effect of various natural organic materials at different stages of decomposition on those physical and chemical properties of soils which affect erosion, by Smith and Richards. The report contains also a note on the development of a discriminant function of pH, available phosphate content, and total nitrogen content of Iowa soils, calculated by use of standard regression coefficients.

Part 2 contains statements of progress on the effects of fertilizers on crops and soil conditions under various rotations or various amounts and at different times in the rotation on crops and soil conditions in the Wisconsin drift soil area, by P. E. Brown and L. W. Forman; effects of various fertilizing materials on crop growth on the Carrington, Tama, and Grundy silt loams and the Webster silty clay loam and on the chemical and bacteriological conditions in these soils, all by H. R. Meldrum and A. J. Englehorn; effects of various fertilizing materials on crop growth on the Clarion loam and the Marshall silt loam and on the chemical and bacteriological conditions in these soils, both by Meldrum; plant food content and lime requirement of Iowa soils and the composition of various crops, by Brown, Englehorn, and F. B. Smith; soil erosion on the Marshall silt loam in Page County, by Brown, G. B. MacDonald, J. B. Davidson, and H. D. Hughes; and effects of fertilizers on the yields of oats and clover on high-lime plats, by Brown, Forman, and J. L. Boatman.

[Soil work, Kentucky Station] (*Kentucky Sta. Rpt. 1937, pt. 1, pp. 29–32, 58*).—Subjects discussed include field work in soil management and crop production, residual effect of superphosphate and rock phosphate, leaching of nitrogen in soil and in lysimeters after legumes which die in early fall, greenhouse tests of availability of phosphates, and a comparison of phosphates for corn, wheat, and hay.

[Soil and fertilizer research, Massachusetts Station] (*Massachusetts Sta. Bul. 347 (1938), pp. 13, 14, 18, 19*).—This contains reports on the magnesium requirements of plants, and soil treatment for potatoes, both by W. S. Eisenmenger and K. J. Kucinski; the use of nitrogen as an aid in decomposing old sod, by J. M. Zak, Kucinski, and Eisenmenger; the comparative nutritive effects of copper, zinc, chromium, and molybdenum, by H. R. DeRose, Eisenmenger, and W. S. Ritchie; borax trials on a market garden soil, by R. W. Donaldson and R. E. Young; and borax trials, by Donaldson, W. G. Colby, and Eisenmenger.

[Soil and fertilizer studies in Nebraska] (*Nebraska Sta. Rpt. [1937], pp. 22–27*).—Results are briefly noted of studies of organic matter in soils, especially lignin and soil pigments; effect on the soil of commercial fertilizers, manure, lime, and straw; the solubility of soil phosphorus; the permeability and tilth of alkali clay-pan soils; relationships between slope, depth of topsoil, and productivity; the succession of vegetation on abandoned land; soil type and land-use relationships; and the development of zones of lime concretions in the soil profile.

[Soil research at the New Hampshire Station] (*New Hampshire Sta. Bul. 304 (1938), pp. 18, 19, 22–24, 25*).—The report notes an investigation by P. N. Scripture and P. T. Blood of the fertilizer resources of the Agawam and Groveton fine sandy loams, the Worthington and Becket loams, and the Merrimack and Colton loamy fine sands; further fertilizer investigations on neglected hay lands and Connecticut Valley soils, by T. G. Phillips, G. P. Percival, F. S. Prince, and Blood; soil testing and recommendations for tests; and tests of T. V. A. phosphatic materials.

[Soil research of the Rhode Island Station] (*Rhode Island Sta. Rpt. [1937], pp. 20–23*).—This work has covered the subjects of optimum soil nitrate

levels, effect of day length and acidity on the assimilation of nitrate and ammonium nitrogen, effects of crops on soil acidity, and the relative availability for plants of different compounds of magnesium.

Obtaining soil samples for rapid soil tests, D. M. Goss (*New Jersey Stas. Circ. 376* (*1938*), *pp. 4*).—Suggestions and a form are given.

A proposed method for classifying and evaluating soils on the basis of productivity and use suitabilities, A. Anderson, A. P. Nelson, F. A. Hayes, and I. D. Wood (*Nebraska Sta. Res. Bul. 98* (*1938*), *pp. 34, figs. 4*).—"The proposed procedure involves a more detailed study of the influence which soils, slope, erosion, and drainage have on specific crops and practices than is contained in the county soil survey reports. It would appear logical to develop it on an area basis, first by selecting counties in which the soils, their environment, and the agricultural practices are fairly typical of the area as a whole, and then enlarging to include all the State." The authors detail the procedure to be used in the determination of slope and erosion conditions on soil types, the determination of present land use according to soil types, the determination of base acreages, and for productivity ratings.

Method of recording soil data, C. C. Nikiforoff. (U. S. D. A.). (*Soil Sci. Soc. Amer. Proc., 1* (*1936*), *pp. 307–317*).—This article points out certain difficulties of exact description inherent in the general nature of soils and details a procedure for systematic soil description in which these difficulties are recognized and are dealt with.

"The problem of a proper recording of the soil characteristics involves . . . a clear general definition of each feature that must be recorded, establishment of several conventional grades or classes of each of these features, and agreement on some definite symbols or terms for the notation of these conventional units. . . . The scaling of each characteristic and the number of grades, or classes, are necessarily arbitrary. The number of classes should be large enough to allow individual separation of each characteristic of importance, and at the same time it should not be too large, in order to avoid possible confusion of many fine separations by a rather rough field determination. It seems more advisable to satisfy oneself with a rather small number of easily recognizable and relatively broad units than to attempt a scrupulous identification of a large number of narrow separations, each possessing only slight distinction from the others."

Soil erosion survey of Pennsylvania, A. L. Patrick. (Coop. U. S. D. A.). (*Pennsylvania Sta. Bul. 354* (*1938*), *pp.* [4]+*23, figs. 11, map 1*).—This bulletin discusses the kinds of erosion, results of erosion, and factors which affect the rate of erosion on some of the most important soil types of the State. A map is included which shows the prevalent types of erosion in different parts of the State. The research program of the Soil Erosion Experiment Station located at Pennsylvania State College and conducted jointly by the college and the U. S. D. A. Soil Conservation Service is also presented.

The effect of the degree of slope and rainfall characteristics on runoff and soil erosion, J. H. Neal (*Missouri Sta. Res. Bul. 280* (*1938*), *pp. 47, figs. 20*).—It is the purpose of this paper to present the results of a study of a few factors affecting erosion which were obtained by setting up a miniature laboratory-controlled field on which the degree and length of slope, the rainfall intensity and duration, and the soil conditions were regulated or measured. Rainfall intensities of 0.9, 1.5, 2, 3, and 4 in. per hour were maintained within 0.2 in. of the required amount. The slope was varied usually by geometric progression between 0 and 16 percent.

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A Putnam silt loam surface soil from a timothy meadow was placed in a wooden soil tank 12 ft. long, 3.63 ft. wide (area=1/1000 acre), and 2 ft. deep. The set-up was in a greenhouse. Artificial rain was applied by an overhead sprinkling system. The run-off and soil losses were determined at 10-min. intervals under cultivated conditions for (1) slopes ranging from 0 to 16 percent, (2) rainfall intensities ranging from 0.9 to 4 in. per hour, (3) rain duration ranging up to 6 hr., and (4) different initial moisture contents and surface conditions of the soil. The infiltration was not affected by either the slope or the rainfall intensity, but varied inversely as the initial soil moisture content. The percentage of slope had no apparent effect on the percentage of run-off for slopes above 1 percent. The percentage of run-off increased as the rain intensity increased but at a decreasing rate.

When the soil was dry before a rain, run-off did not occur until several minutes after the rain started. The time elapsing between the beginning of the rain and the time when run-off occurred decreased as both the slope and the rainfall intensity increased. After run-off started there was a continual increase in the rate until the infiltration rate had become approximately constant. This occurred from 1 to 2 hr. after the beginning of the rain. After from 1 to 2 hr. the run-off was approximately constant. The density of the run-off material decreased during the first hour of a rain. When the rain continued longer, the density remained approximately constant. From 1½ to 2 times as much run-off was required to remove a pound of soil at the end of 1 hr. as at the beginning of the rain. The relative density of the run-off material increased as both the slope and the rainfall intensity increased.

The soil losses from a saturated soil increased as the 0.7 power of the slope, the 2.2 power of the rainfall intensity, and directly as the time of duration of the rain. The amount of erosion from a soil which was in a dry condition at the beginning of the rain was affected by the initial soil moisture content and the condition of the soil surface, in addition to the degree of slope, the rainfall intensity, and the duration of the rain. The soil in a dry pulverized condition or one in a dry rough condition absorbed much more rainfall than when in a smooth, hard, baked condition.

A bibliography of 33 references on the subject is included.

The reclamation of the Dutch saline soils (Solonchak) and their further weathering under the humid climatic conditions of Holland, D. J. Hissink (*Soil Sci., 45 (1938), No. 2, pp. 83–94*).—This contribution from the Institute of Soil Science, Groningen, deals with the treatment of heavy argillaceous soils formed from sea deposits brought in by the recurrent tides against the sea dikes.

"Because of continuous accretion, the mud deposits gradually accumulate until they are too high to be covered by the normal summer tides. It is obvious that the reclamation of these Dutch saline soils has, in the humid Dutch climate, a somewhat different aspect from that of similar reclamation in semiarid and arid regions, such as those of Hungary, southern Russia, and California. The annual rainfall in the Netherlands is sufficient entirely to wash out the salts within a few years, provided the drainage conditions are otherwise good. When the muddy deposits have accumulated sufficiently to rise above the normal summer tides, the salts are consequently washed out of the upper 20 to 30 cm of the muddy deposits by the summer rains to such an extent that the original salt vegetation (seaweed, *Salicornia*, etc.) gives way to a grass flora. These grass-grown deposits are called 'kwelders.' They are covered only by the high tides, especially in winter. When the kwelder is high enough, a dike is built to keep out the sea water. The kwelder is now transformed into a young sea

polder. The muddy deposits are therefore to be regarded as the first step in the formation of marine clay soils, which are well known to be the most fertile soils in the Netherlands, both from a chemical and from a physical point of view. For many decades the young marine clay soils yield abundant crops, without the use of any fertilizer, and even at a great age (200 to 400 yr.) they are regarded as among the most valuable arable lands."

Important reactions in the formation of fertile soil from the marine deposits include the oxidation of ferrous sulfide, which, in the presence of calcium carbonate, results in the formation of ferric oxide and calcium sulfate and bicarbonate, the soluble calcium compounds, in turn, replacing exchangeable sodium and magnesium with calcium. The aeration needed for this oxidation, together with a drying of the surface soil sufficient to induce the fissuring necessary for penetration of rain water and removal of salts, requires thorough and rapid drainage.

It is found to be especially important that the soil become permeable to water before the end of the salt period, during which the soil still contains salts sufficient to prevent the peptization of the sodium-clay-humus substance. If sufficiently permeable, the salts, and later the products of the exchange process also, and especially the sodium salts, can be rapidly carried off. If, on the other hand, the washing out of the salts from the soil occurs in the muddy period, the soil may, because of the peptization, become almost impermeable to water.

Some thermal phenomena in a selected Hawaiian soil, H. A. WADSWORTH. (Hawaii Expt. Sta.). (*Soil Sci., 45 (1938), No. 4, pp. 251–262, figs. 3*).—In attempts to use freezing-point depressions in the determination of permanent wilting point, when the freezing point depressions obtained from any one series were expressed as corresponding pF values (E. S. R., 75, p. 169) and plotted against soil moisture contents, a smooth curve resulted in about the position expected from determinations of moisture equivalent and permanent wilting percentage. Upon repetition "a second smooth curve might be obtained, but ordinarily the second curve was not coincident with the first. It soon became apparent that the air conditions in the laboratory were at least partially responsible for this unexpected result. Samples brought down to suitable moisture contents on a hot, dry day exhibited a much lower pF, at a given moisture content, than would be found if the samples were prepared during a colder day with relatively high humidity. This effect was much exaggerated when samples were prepared by short-time drying in a low temperature oven." A detailed study of the behavior of one local soil was then made. The results indicated that the freezing-point depression was significantly affected by the degree of uniformity of moisture distribution within the sample. Further study gave some evidence that a measurable evolution of heat occurs when relatively dry soils are brought into close proximity to wetter soils. There was also some evidence that the conventional heat of wetting, with soils at initially varying moisture contents, is closely correlated with the moisture potential of the sample.

A study of the chemical equilibrium existing between soluble salts and base-exchange compounds, J. D. PETERSON and D. S. JENNINGS. (Utah Expt. Sta.). (*Soil Sci., 45 (1938), No. 4, pp. 277–292, fig. 1*).—This investigation has shown that calcareous soils, when in contact with $NaHCO_3$, contain more replaceable sodium than when the soluble salts have been removed; that all

replaceable sodium in calcareous soils may be replaced by continued leaching with distilled water; that when a soil or bentonite is brought into contact with a salt solution, all types of cations present in the solution enter into the exchange complex; that the bases present in the solid phase, after the chemical treatment is complete, are independent of the nature of the replaceable bases present before the treatment; that replaceable calcium was present in soils and bentonite treated with salts of sodium and potassium (especially when $CaCO_3$ was present); that the base-exchange capacity for bentonite was less when treated with potassium than when treated with sodium or calcium; and that the sum of the separate replaceable bases is usually higher than the total base capacity as indicated by the absorbed ammonia.

In the interpretation of base-exchange phenomena use is made of "a network of chemical equations sufficiently extensive to include equilibrium in the presence of calcium carbonate and also in contact with the atmosphere."

The equations given are shown to provide an adequate interpretation of the presence of large quantities of replaceable sodium when sodium bicarbonate or carbonate is present in the soil; the removal of replaceable sodium when calcareous soils are leached with distilled water; the presence of replaceable calcium when soils or bentonite containing slightly soluble calcium compounds is treated with sodium and potassium salts; the low value of base capacity, determined by the ammonium acetate method, as compared to the sum of the replaceable bases; a decrease of sodium and potassium ions when calcium carbonate is added to acid soils; the inability to recover all soluble carbonate added to soils; and relationships existing between dispersion of colloids and chemical properties of colloids. "Phenomena reported which cannot be explained from the network of equations but which may be related to certain prenomena reported in the literature are as follows: Similarity of the chemical properties exhibited by colloids and weak electrolytes and lower base-exchange capacity of potassium-treated bentonite. Data presented indicate that the law of mass action, if not rigorous, is a close approximation for base-exchange reactions."

Composition of soybean nodules and root nodule bacteria, W. W. Umbreit and R. H. Burris. (Univ. Wis.). (*Soil Sci., 45 (1938), No. 2, pp. 111–126*).—In a comparison of the nitrogen fractions of different portions of the soybean plant, the data indicate that both the entire fresh tissue and its soluble portion are alike throughout the plant. No unique components were found to exist in the nodule with the possible exception of nonamino basic nitrogen. It appeared that the difference in composition of the nodules relative to the remainder of the plant is primarily of a quantitative rather than of a qualitative nature. Nodules are higher in total nitrogen per unit weight, but, in general the same types of organic nitrogen compounds are found in these specialized tissues as in the other portions of the plant.

In a detailed analysis of dried nodular tissue, arginine "(basic substances which yield NH_3 on alkaline digestion)" was observed to constitute almost 20 percent of the nitrogen in the tissue. It was further shown that the nonamino nonbasic nitrogen fraction, which has been found in increasing proportion in plants as they mature, is probably proline. In the soluble portion of fresh nodular tissue it was likewise found that arginine comprises a very large percentage of the basic amino acids present. "It seems likely that the basic nonamino nitrogen . . . of possible importance in the symbiotic nitrogen fixation process originates from the arginine content of the basic fraction."

Influence of manure, irrigation, and cropping practices upon soil microbiological activities, K. R. Stevens. (Utah Expt. Sta.). (*Soil Sci., 45 (1938), No. 2, pp. 95–109, figs. 9*).—On the average, in these irrigation treatments th

larger quantities of manure in both fallowed and cropped soils increased the total nitrogen and organic carbon contents, the numbers of micro-organisms, and the power of the soils to decompose organic matter, to accumulate nitrates, and to fix nitrogen.

On averaging all manurial treatments, a tendency of certain microbiological activities to increase as the amount of water applied increased was noted. In both the cropped and fallowed soils these activities included numbers of bacteria and actinomyces, the evolution of CO_2 from dextrose, the accumulation of nitrates, and the fixation of nitrogen. In the cropped soils the influence of added water on the numbers of filamentous fungi and on evolution of CO_2 from the original soil and from added cellulose was negative, and on total nitrogen and total organic carbon content this effect was not appreciable. The addition of water to fallowed soils decreased the numbers of filamentous fungi, the production of CO_2 from cellulose, and the total nitrogen content, while the total organic carbon content remained constant.

The numbers of bacteria, actinomyces, and fungi and the quantity of nitrogen fixed in the fallowed soils were higher than those in the cropped soils under both irrigation and manuring. The accumulation of nitrates was favored in the cropped soils.

Under the influence of manure the fallowed soils exceeded the cropped soils in the production of CO_2 from the original soil and from added dextrose. No apparent differences in the total organic carbon content of these soils was found. The greatest influence of irrigation in the fallowed soils was that on the numbers of micro-organisms, the evolution of CO_2 from cellulose, nitrogen fixation, and total organic carbon. Irrigation favored the cropped soils in CO_2 evolution from original soils and from added dextrose, but had little if any influence on the accumulation of nitrates from ammonium sulfate and dried blood, the fixation of nitrogen, and the total nitrogen content.

Organic residues and nitrogen fertilizers in relation to the productivity and humus content of Palouse silt loam, H. F. HOLTZ and S. C. VANDECAVEYE (Wash. Expt. Sta.). (*Soil Sci., 45 (1938), No. 2, pp. 143–163, figs. 2*).—Results of laboratory studies on carbon dioxide evolution and nitrate-nitrogen accumulation indicated a possible relationship between available nitrogen and the formation of humus in the soil. The carbon: nitrogen ratio of the soil humus in the various plats seemed to be slightly greater after 13 yr. of soil treatment than before such treatment, but remained remarkably uniform in all plats regardless of the system of cropping practiced or of the nature and amount of crop residues and nitrogen fertilizers applied to the soil. Annual applications of organic residues, except the application of straw alone, were effective in increasing the humus content of the soil under annual cropping with wheat. The gain in humus was roughly proportional to the amount of nitrogen supplied to the soil by means of organic residues or as a supplement to these residues. A marked loss of soil humus occurred under alternate cropping and summer fallow in spite of additions of organic residues. The loss of humus by microbial activity was so great during the summer-fallow year that it could not be overcome fully by applications of organic residues in amounts consistent with field practice. Evidence to show that the decomposition of organic residues in Palouse silt loam under its natural climatic environment results in the formation of humus with a carbon: nitrogen ratio of approximately 12 was obtained. Any carbon added in excess of this ratio by means of organic residues was rapidly dissipated by CO_2 evolution.

Applications of various organic residues under field conditions or of nitrogen fertilizers alone or as a supplement to the organic residues did not result in

appreciable increases in yield under alternate cropping and summer fallow but caused substantial increases in average yields of wheat under annual cropping, the increases being roughly proportional to the amounts of nitrogen applied to the soil. Yields under annual cropping gradually declined, regardless of soil treatments. The addition to the soil of substantial quantities of nitrogen in various forms resulted in an increased average nitrogen content of the grain. Not all the nitrogen disappearing from the plowed layer could be accounted for by the amounts assimilated by crops. It appeared that some of this was lost by leaching to lower depths, and that this loss was considerably greater under alternate cropping and summer fallow than under annual cropping.

[**Effect of wheat straw on the available soil nitrogen**], A. N. HUME (*South Dakota Sta. Rpt. 1937, p. 9*).—Results of tests are briefly noted.

A study of various organic and inorganic phosphates, with special reference to their ability to penetrate soils and to their positional and chemical availability to plants, V. E. SPENCER, R. STEWART, and S. A. LOUGH (*Nevada Sta. Rpt. 1937, pp. 38–40*).—This study has included an investigation of the phosphate absorption of separately supplied parts of the root system.

Phosphate investigations on irrigated crops, 1937, J. R. GREEN (*Montana Sta. Bul. 356 (1938), pp. 31, figs. 10*).—Good results were obtained when treble superphosphate was applied with the seed of grains or before the seed. When phosphate was applied to crops at the rate of 125 lb. per acre considerable fertilizer was left over from the first year, and the crop produced during the second year was often greatly improved. Four alfalfa fields that still gave good response to phosphate 3 yr. after application are reported. The increase in percentage of phosphoric anhydride in crops is in part a measure of the availability of a phosphate used as a fertilizer. An increase in moisture content of alfalfa fertilized with phosphate usually accompanies an increase in yield. An average increase of over 2 tons of beets per acre was obtained by the application of phosphate to several fields. The sugar content of beets was increased by the use of phosphate. Liquid phosphoric acid diluted and applied by tubes into the furrows made by the disks of the drill gave good results on beets.

In the comparative study of T. V. A. fertilizers and a treble superphosphate on alfalfa and grains the three acid phosphates—treble superphosphate, T. V. A. superphosphate, and T. V. A. monocalcium phosphate—gave good results. Dicalcium phosphate gave much smaller increases in yield than did the three acid phosphates. Calcium metaphosphate and fused rock gave poor results. Raw phosphate rock had no effect on yield of alfalfa or beets.

Boron, zinc, copper, manganese, or iodine added to treble superphosphate had no apparent effect in several tests on beets, alfalfa, and grains. The small amount of nitrogen and potash in a complete fertilizer, 4–16–4, did not change the results materially over a regular treble superphosphate applied at a higher rate. When single and double disks were used on the drill to apply treble superphosphate, there was no difference in the results.

Making lime on the farm, N. A. KESSLER (*U. S. Dept. Agr., Farmers' Bul. 1801 (1938), pp. [2]+21, figs. 8*).—This deals with factors which should be considered by a farmer or a group of farmers before investing in equipment for obtaining lime from limestone or marl. It discusses especially the quarrying, grinding, and burning of limestone and the digging of marl.

Fertilizers for Tennessee soils, C. A. MOOERS (*Tennessee Sta. Circ. 60 (1938), pp. 2*).—Recommendations "intended to be practical applications for average upland conditions" on four groups of soils with the crops commonly grown on them are presented.

Farmers can reduce fertilizer cost, A. W. Blair (*New Jersey Stas. Circ. 375 (1938), pp. 3, fig. 1*).—Of 118 fertilizer grades registered in New Jersey in 1937, 10 grades covered nearly 80 percent of the total tonnage. The extra cost to the farmer involved in the large number of grades, mostly of small tonnage sale, is pointed out, and remedies are suggested for reducing the number.

Commercial fertilizers, H. R. Kraybill et al. (*Indiana Sta. Circ. 235 (1938), pp. 80, fig. 1*).—This 1937 fertilizer analysis report shows that more than 84 percent of the total tonnage was confined to 33 analyses.

AGRICULTURAL BOTANY

[Botanical work by the Iowa Station] (*Iowa Sta. Rpt. 1937, pt. 1, pp. 118, 119, 121, 122*).—Progress reports are given on studies of the distribution and ecology of plants in the waterfowl breeding areas of Iowa, by A. Hayden, and relation of plant cover to erosion control, by J. M. Aikman and A. F. Dodge.

Abstracts of doctoral theses. (Iowa State Col.). (*Iowa State Col. Jour. Sci., 12 (1937), No. 1, pp. 140, 141, 151–154, 170–172*).—The following abstracts are of interest to botany: The Effect of Certain Stimulants Upon the Growth of Yeast, by J. B. Lesh; The Influence of the Phosphate-Calcium Ratio and of Humates of Iron on Chlorosis in *Lemna*, by D. H. Sieling; and The Butyl-Acetonic Fermentation of the Jerusalem Artichoke, by R. T. Wendland.

A device for orienting and embedding minute objects, J. B. Buck (*Stain Technol., 13 (1938), No. 2, pp. 65–68, figs. 2*).—The device described and illustrated for use with objects 200μ or less in diameter consists of a small paraffin bath heated by a removable wire coil and provided with a water jacket for rapid cooling of the block. The material is oriented under the microscope by use of electrically heated needles.

Dissection, staining, and mounting of the embryos of conifers, J. T. Buchholz. (Univ. Ill.). (*Stain Technol., 13 (1938), No. 2, pp. 53–64, figs. 3*).—A full description is given of the procedures and advantages of the technics presented. The choice of dissecting microscopes and instruments, and directions for staining embryos with phloxine which may be combined with slow dehydration in glycerin, or for staining with Delafield's or Heidenhain's hematoxylin which may be followed by the glycerin dehydration are given. Glycerin is said to afford a convenient break for a temporary stopping place in this technic. Directions are included for transfer from glycerin through 95 percent alcohol into other solvents (e. g., diaphane solvent, essense of euparel, or a sandarac solvent). Other mounting media used are discussed—glycerin jelly, Venetian turpentine, and Canada balsam—with special emphasis on the advantages of media employing sandarac.

A freezing apparatus in which change of temperature is automatically controlled, W. W. Smith and G. F. Potter (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 151–155, figs. 4; also New Hampshire Sta. Sci. Contrib. 60 [1937], pp. 151–155, figs. 4*).—The apparatus described and illustrated was devised for work with winter injury, in which it was desired to have a freezing chamber with which indications of winter hardiness in plant tissues could be obtained without awaiting a winter test. The principle involved is the same as that in an apparatus previously described by Potter (E. S. R., 44, p. 322), but the present machine is new in mechanical design. It has been in successful operation for several months.

A method for cultivating root nodule bacteria to facilitate staining of their flagella, R. M. Stern and W. B. Sarles. (Univ. Wis.). (*Stain Technol., 13 (1938), No. 2, pp. 73, 74*).—The method presented describes a culture procedure

for *Rhizobium* forms which is said to reduce the production of gum to a minimum and thereby to facilitate the staining of the flagella. The method involves the use of D. G. Laird's modification of Hitchner's medium, in which the absence of mannitol tends to reduce this formation of gum.

Use of the Gray flagella stain for slime-forming bacteria, A. W. Hofer and J. K. Wilson. (N. Y. State Expt. Sta. and Cornell Univ.). (*Stain Technol., 13 (1938), No. 2, pp. 75, 76*).—A slight modification of the P. H. H. Gray flagellum stain is outlined as successfully used on the legume-nodule bacteria and on *Bacterium radiobacter* and various other soil and water bacteria.

The precipitation of erythrosin by members of the coli-aerogenes group, R. L. France and J. E. Fuller. (Mass. Expt. Sta.). (*Zentbl. Bakt.* [etc.], 2. *Abt., 97 (1937), No. 14-17, pp. 312-314, fig. 1*).—An attempt at differentiating members of this group.

Cytology of bacteria, G. Knaysi. (Cornell Univ.). (*Bot. Rev., 4 (1938), No. 2, pp. 83-112*).—This review (with over four pages of bibliography) is concerned with the form and size of the bacterial cell, its structure, the nuclear question, vacuoles, inclusions, reserve material, the cell membrane, motility, cell division, resistant and reproductive forms, and some relations of bacteria to dyes. The author shows the magnitude of the work already done and that still needed. He stresses the point that the taxonomic values of morphological criteria are still far from being exhausted.

The flagellation of bacteria, H. J. Conn and G. E. Wolfe. (N. Y. State Expt. Sta.). (*Science, 87 (1938), No. 2256, pp. 283, 284, figs. 3*).—This preliminary report calls attention to the fact that there seems to be evidence of three types of bacterial flagellation, (1) typically peritrichic, (2) definitely polar, and (3) apparently degenerate forms of (1), with the flagella so few in number and with all but one so often missing that without extensive study it might well be referred to (2). It is suggested that motile forms be grouped on the basis of a correlation of characters, rather than that bacteria with only one flagellum be separated from those with from three to four peritrichic flagella.

Colony organization of certain bacteria with reference to sporulation, H. C. Greene. (Univ. Wis.). (*Jour. Bact., 35 (1938), No. 3, pp. 261-274, figs. 14*).—This contribution reports the results of studies of stained sections of colonies of *Clostridium acetobutylicum*, *C. pasteurianum*, and *Bacillus acetoethylicum* to determine the course of sporulation within the colonies under (1) conditions taken as standard, and (2) in the third species under varying conditions also.

A study of the bacterial and alleged mitochondrial content of the cells of the clover nodule, E. D. Miller (*Biol. Bul., 73 (1937), No. 1, pp. 112-125, figs. 24*).—The morphology of minute cytoplasmic inclusions as they occur in clover nodules, their response to Janus green and lipoid solvents, etc., are believed to support strongly the inference that minute bacterial forms have heretofore been misinterpreted as mitochrondria in these nodules.

The adsorption of bacteria by marine bottom, S. A. Waksman and U. Vartiovaara. (N. J. Expt. Stas. et al.). (*Biol. Bul., 74 (1938), No. 1, pp. 56-63*).—Marine mud was found to exert an adsorptive effect on bacteria in sea water. The results of laboratory experiments indicated that certain types of marine bottom material exert a controlling effect on the numbers of bacteria in intimate contact with them, but there was no indication of permanent paralysis of bacterial growth or metabolism.

Identification of Phytomonas, Azotobacter, and Rhizobium or Achromobacter upon initial isolation, C. S. Bryan. (Mich. Expt. Sta.). (*Soil Sci., 45 (1938), No. 3, pp. 185-187*).—Because of the presence of *Achromobacter* and

Phytomonas colonies, much confusion results in determining the *Azotobacter* content of the soil and in isolation of *Rhizobium* from nodules. The addition of 20 cc of a 1-400 aqueous solution of Congo red (1-20,000 final dilution in the medium) afforded a satisfactory differentiation of *Phytomonas*, *Azotobacter*, and *Rhizobium* or *Achromobacter* colonies. Duplicate dilutions should be plated in nitrogen-free agar of pH 11, only *Achromobacter* growing in this medium.

Studies on anaerobic bacteria.—X, Heat stable and heat labile antigens in the botulinus and related groups of spore-bearing anaerobes, L. S. McClung (*Jour. Infect. Diseases, 60 (1937), No. 1, pp. 122–128*).—Continuing this series (E. S. R., 75, p. 606), from a study of a large collection of strains it was found that the subgroups based on agglutination reactions of cultures of *C. parabotulinum* depend on the heat or flagellar antigen. The antigens of *C. botulinum* appeared to be specific, but some cross reaction was found with *C. sporogenes* and *C. parabotulinum*.

Studies on anaerobic bacteria.—XI, On the properties of the H agglutinogens of a mesophilic and a thermophilic species, E. McCoy. (Univ. Wis.). (*Jour. Bact., 34 (1937), No. 3, pp. 321–341, figs. 7*).—This study concerned *Clostridium butyricum* (mesophilic) and *C. thermosaccharolyticum* (thermophilic).

Studies on anaerobic bacteria.—XIII, A cultural study of some "butyric" anaerobes previously described in the literature, N. O. Sjolander and E. McCoy. (Univ. Wis.). (*Zentbl. Bakt. [etc.], 2. Abt., 97 (1937), No. 14–17, pp. 314–324*).—This continuation of the series (E. S. R., 78, p. 766) reports a study of the morphological and physiological properties of a group of butyric acid-forming anaerobes, most of which had been previously described in the literature. The experimental results are compared with original descriptions where possible, and certain characteristics are reported for the first time.

The production of chemicals by filamentous fungi, L. B. Lockwood and A. J. Moyer (*Bot. Rev., 4 (1938), No. 3, pp. 140–164*).—It is stated that only during the last century has man undertaken the scientific cultivation of fungi to obtain useful products of their metabolism. In addition to general considerations on this subject, this review (with 173 literature references) discusses the types of apparatus and procedures used in such work, and the products obtained: Gluconic, citric, oxalic, fumaric, succinic, lactic, glauconic, gallic, kojic, and luteic acids, polysaccharides, mannitol, fats, ergot, gums, pigments, enzymes, and various miscellaneous products.

Importance of silicon, aluminum, and chlorine for higher plants, C. B. Lipman. (Calif. Expt. Sta.). (*Soil Sci., 45 (1938), No. 3, pp. 189–198*).—In culture-solution experiments with Si, Al, and Cl, sunflowers and barley were definitely benefited, especially as to seed production, by the presence of Si, while sunflowers and corn reacted similarly to Al. Buckwheat and peas were definitely benefited by Cl—the first both as to dry matter and seed production, and peas apparently (in limited tests) only as to seed production. It is deemed highly probable that all three elements may be indispensable to higher plants in general.

Morphological response of the potato (Solanum tuberosum) to abrupt environmental changes, H. O. Werner. (Nebr. Expt. Sta.). (*Amer. Potato Jour., 13 (1936), No. 6, pp. 150–155, figs. 2*).—Groups of potted Triumph potatoes grown under each of four conditions (long and short day, and cold and warm temperature) in the greenhouse were shifted to each of the other conditions. Transferring to lower or higher temperatures, regardless of day length, respectively prolonged or shortened the life, while transfer from long to short days at the same temperature shortened and the reverse transfer slightly prolonged

substances, *Avena* growth substances); B-growth substances, the bios group, and vitamins; and other growth-promoting substances. A concluding section takes up the growth substances in relation to the development of the higher plants, and the growth substance cycle. A 10½-page bibliography and a key-word subject index are provided.

The influence of certain plant hormones on growth of protozoa, A. M. Elliott (*Physiol. Zool., 11 (1938), No. 1, pp. 31–39, figs. 6*).—Three-indoleacetic, β-3-indolepropionic, and γ-3-indolebutyric acids tested over a wide pH range markedly accelerated growth of the chlorophyll-bearing *Euglena gracilis* at pH 5.6 and at concentrations of 1:1,000,000 and 1:10,000,000. No favorable effects were seen on either the colorless flagellate *Khawkinea halli* or the holotrichous ciliate *Colpodium striatum*, and at certain concentrations of these plant hormones growth retardation was induced.

The wound hormones of plants.—I, Traumatin, the active principle of the bean test, J. English, Jr., and J. Bonner (*Jour. Biol. Chem., 121 (1937), No. 2, pp. 791–799*).—By the quantitative biological test described, a substance believed to be the nearly pure hormone "traumatin" was isolated from bean pods. It is an amorphous, water-soluble, acidic compound, active in the test to a dilution of 1 : 100,000. The empirical formula $C_{11}H_{17}O_4N$ was indicated for the monomethyl ester.

Hormones and root formation, W. C. Cooper (*Bot. Gaz., 99 (1938), No. 3, pp. 599–614*).—Portions of stem cuttings of apple and lemon, some of which had been treated at the apex and some at the base with indoleacetic acid, showed large amounts in the bark immediately afterwards, but ±90 percent disappeared during the first day. Very little was recovered from the bark at the apex of cuttings treated at the base with 0.001, 0.005, and 0.02 percent solutions, but moderate amounts were recovered from the base of cuttings treated at the apex with these auxin solutions. The 0.02 percent solution applied at the base was the only treatment tested which gave a significant increase in root formation on lemon cuttings. There was little difference in the amount of auxin recovered from treated apple vs. lemon cuttings, yet the former failed to form roots. It is thus assumed that apple cuttings lack certain necessary internal substances. Tests involving removal of the treated base and treatment of the new base indicated the action of indoleacetic acid in root formation to be primarily in mobilizing root-forming substances naturally present.

Evidence is presented as indicating that leaves of lemon cuttings supply a substance necessary for differentiation of the root primordia, and another for their outgrowth. The first appears to be transported rapidly to the base under the influence of indoleacetic acid, whereas the second is transported slowly.

The effect of auxins on protoplasmic streaming, II, B. M. Sweeney and K. V. Thimann (*Jour. Gen. Physiol., 21 (1938), No. 4, pp. 439–461, figs. 13*).—Continuing this study (E. S. R., 78, p. 760) of the effect of indole-3-acetic acid on protoplasmic streaming in the epidermal cells of oat coleoptiles, the transient nature of the effect (acceleration and retardation) was found to be due to the temporary exhaustion of carbohydrate from the tissues. The retardation of streaming induced by concentrations of auxin above 0.5 mg per liter was due to oxygen deficiency, from which it follows that the auxin effect is to increase respiration in the coleoptile tissue. Younger coleoptiles (3 cm long) were sensitive to lower concentrations than those 5 cm long, and they more readily exhibited oxygen deficiency as a result of the auxin action. After their decapitation, however, the response to auxin more closely resembled that of the 5-cm coleoptiles. Retardation of streaming in such coleoptiles, resulting from oxygen deficiency, was delayed by very dilute solutions of histidine.

The mean rate of streaming in untreated coleoptiles in pure water varied with the time of year but not with the time of day. The results are taken to support the view that auxin accelerates an oxygen-consuming process which controls the rate of protoplasmic streaming, and that the latter controls growth. The substrate for this process is believed to be sugar. It is suggested that auxin also accelerates another oxygen-consuming process, which may withdraw oxygen from the process controlling streaming rate and hence cause retardation of the latter.

The interdependence of auxin and sugar for growth, C. L. SCHNEIDER (*Amer. Jour. Bot.*, *25* (*1938*), *No. 4, pp. 258–270, figs. 9*).—Using the Bonner *Avena* coleoptile "section test" (E. S. R., 70, p. 755), an extract of the endosperm of the oat seedling was shown to promote growth of sections, particularly in the presence of auxin, this effect being due to its sugar content. Sugar is thus taken to be a major component of the food factor complex postulated by Went (E. S. R., 74, p. 467). The results of treating auxin- and sugar-deficient sections with auxin and sugar, respectively, have indicated that both substances are necessary for growth. It was also found that under certain conditions the effects of auxin and sugar on growth are interdependent in such a manner that, for suboptimum concentrations, an increase in concentration of either one alone gives an increase in the growth rate, its magnitude being proportional to the product of the logarithms of the concentrations. "By postulating an upper limit to the growth rate, set by the capacity of the growth system, it is consistent with present knowledge to apply this formula generally."

A photokymograph for the analysis of the Avena test, C. L. SCHNEIDER and F. W. WENT (*Bot. Gaz.*, *99* (*1938*), *No. 3, pp. 470–496, figs. 14*).—Using an automatic kymograph (described), it was found that, in general, when auxin was applied unilaterally there was little or no effect for about 20 min., after which curvature set in and continued at a constant rate for about 1 hr., and then diminished or reversed, depending on the treatment. An increase of auxin concentration inside the plant decreased the sensitivity to unilateral application, thus explaining the increase in sensitivity after decapitation. With different auxin concentrations, for all up to the maximum angle concentration, the sensitivity increased rapidly for the first 30 min. i. d. p. (interval between decapitation and putting on of the agar block), increased gradually up to 200–240 min. i. d. p., and then gradually decreased. However, the maximum angle concentration fell off rapidly for the first 100 min. i. d. p. For an i. d. p. longer than 100 min., a second decapitation just before putting on the block caused (1) the reaction to maximum angle concentration to be doubled, (2) the reaction to extremely low concentrations to be slightly decreased, and (3) more uniform reactions. A modified *Avena* test is recommended, viz, an i. d. p. of 3–4 hr., a second decapitation 20–40 min. before putting on, and photographs at 90 min. after putting on. Besides the regeneration effect that reverses the curvatures at 130 min. after decapitation for an i. d. p. of less than 50 min., there is also a pseudo-regeneration effect for a longer i. d. p. that also balances or reverses the curvature at 80–90 min. after putting on. This and certain other effects cannot be explained by geotropism, lateral transport of auxin, or aging. It is tentatively suggested that these effects may be due to food-factor distribution.

Stimulating effect of beta(3)indoleacetic acid on synthesis of solid matter by bean plants, J. W. MITCHELL and C. L. HAMNER (*Bot. Gaz.*, *99* (*1938*), *No. 3, pp. 569–583, figs. 5*).—After removal of the stem tips of *Phaseolus vulgaris* plants, lanolin plus different concentrations of indoleacetic acid was applied to the cut surfaces. At concentrations higher than ±0.00185 percent, axillary-bud development was retarded, tumors and roots formed on the stem

ends, and parts near the point of treatment increased more in fresh and dry weights than like parts of control plants. At lower concentrations the inhibitive effect on axillary-bud development was less, the tumors induced were much smaller, and no roots were formed. By removing the axillary buds from treated and control plants, effects other than bud inhibition were studied. Dilute concentrations caused plants with axillary buds removed to gain 23–85 percent more solid matter during six days than the controls. The final dry weights of treated plants were 6–11 percent greater, although the average initial weights of both groups were the same. Plants with their axillary buds removed were stimulated to synthesize much more solid matter under light of relatively high intensity than when treated with the same concentration of indoleacetic acid and grown under low light intensity. The leaf surface area of treated plants with axillary buds removed was not appreciably greater than that of similar untreated plants at the end of six days' treatment.

Nicotinic acid and tobacco metabolism, R. F. Dawson (*Science, 87 (1938), No. 2255, p. 257*).—Preliminary observations on tobacco plants cultured with their cut ends in dilute aqueous solutions of nicotinic acid hydrochloride indicated large and apparently specific influences on the degree and duration of leaf turgidity, rates of uptake of solution and dry weight accumulation, and postponement of permanent wilting. There was also an effect on nicotine synthesis.

Note on sulphanilamide and other chemicals that act as plant growth promoting substances, N. H. Grace (*Canad. Jour. Res., 16 (1938), No. 3, Sect. C, pp. 143, 144*).—Using the yeast test and a method involving application of a talc pellet containing the active chemical to the surface of a Petri dish culture of bacteria or fungi, it was indicated that coumarin, vanillic acid, 1- and 2-γ-naphthylbutyric acid, and sulfanilamide have a definite measure of activity as growth-promoting substances. In lesser degree several other substances possessed a similar activity. "This similarity in the behavior of plant hormones and sulfanilamide suggests that the therapeutic effectiveness of the latter may be attributed, in some measure at least, to its hormone-like properties."

Vitamin B_1 or its intermediates and growth of certain fungi, W. J. Robbins and F. Kavanagh (*Amer. Jour. Bot., 25 (1938), No. 4, pp. 229–236, figs. 8*).—The importance of vitamin B_1 for the growth of *Phycomyces blakesleeanus* was confirmed. A number of saprophytic fungi grew well for two transfers in a fluid medium of mineral salts, asparagine, and dextrose, and were unaffected by addition of 30 units (a unit being 10^{-9} mole) per flask of vitamin B_1, while a number of parasitic fungi grew poorly or not at all in this medium without this vitamin but grew well with 30 units per flask added. *Rhizopus nigricans* (+ and −) grew well in the basic medium alone, but less satisfactorily when the same amount of vitamin B_1 was added (growth of the minus strain being the more affected of the two). *P. nitens* grew well in the basic medium to which 30 units per flask of the thiazole and pyrimidine intermediates were added—either one alone proving ineffective. *Phytophthora fagopyri, Pythium butleri, P. polycladon, Sclerotium delphinii, S. rolfsii,* and *Sphaerulina trifolii* grew well in the same basic medium with the two added intermediates or with the pyrimidine intermediate alone added. Thiazole added alone proved ineffective. The synthesis of thiazole by some of the fungi when grown in a pyrimidine medium was demonstrated.

Ecology of the grassland, H. C. Hanson. (N. Dak. Expt. Sta.). (*Bot. Rev., 4 (1938), No. 2, pp. 51–82*).—This is limited chiefly to a discussion of the nature of the characteristics classified under floristics and community struc-

ture. The methods of study and their applications in grassland research are described and evaluated. Suggestions for the advance of grassland ecology are made, and a bibliography of 117 titles is appended.

Flora of southeastern Washington and of adjacent Idaho, H. St. John *(Pullman, Wash.: Students Book Corp., 1937, pp. XXV+531, [pl. 1], figs. 11).*—This covers the flora of Spokane, Whitman, Asotin, Garfield, Columbia, and part of Walla Walla Counties in Washington, and in Idaho a strip about 15 miles wide adjacent to the Washington area. The flora as here presented includes 459 genera, 1,187 species, and 286 subdivisions of species. Of the total, 1,266 are indigenous and 207 adventive. Keys to families and species, a glossary, an annotated list of authors, a list of new species and new combinations, and an index to common and scientific names are provided.

Plant material introduced by the Division of Plant Exploration and Introduction, Bureau of Plant Industry, October 1 to December 31, 1934 *(U. S. Dept. Agr., Inventory 121 (1938), pp. 56).*—This number lisits 1,187 lots of plant material, with descriptive notes in many cases.

GENETICS

Cytological investigations of Pisum sativum, G. O. Cooper *(Bot. Gaz., 99 (1938), No. 3, pp. 584–591, figs. 28).*—This reports data on the cytology and development of the microspore, megaspore, megagametophyte, and ovule in the common pea. The haploid number of chromosomes was found to be seven.

Chromosome numbers in the European grape (Vitis vinifera), H. P. Olmo. (Univ. Calif.). *(Cytologia, Fujii Jub. Vol., 1937, pt. 1, pp. 606–613, figs. 5).*

A review of chromosome numbers in the Hemerocallideae, Alstroemeriales, and Amaryllidales, W. S. Flory and S. H. Yarnell. (Tex. Expt. Sta.). *(Herbertia, 4 (1937), pp. 163–172, 175–181).*—This review is accompanied by a bibliography of 146 titles.

Chromosome numbers in the Polemoniaceae, W. S. Flory. (Tex. Expt. Sta.). *(Cytologia, Fujii Jub. Vol., 1937, pt. 1, pp. 171–180, figs. 19).*

Chromosome structure.—XI, Hordeum vulgare L. and Secale cereale L., M. L. Ruttle and B. R. Nebel. (N. Y. State Expt. Sta.). *(Cytologia, Fujii Jub. Vol., 1937, pt. 1, pp. 553–568, figs. 20).*—Continuing these studies (E. S. R., 76, p. 608), the authors describe and illustrate the chromosomal structure of barley and rye at various stages of somatic mitosis and of meiosis. See also references to later parts (E. S. R., 78, p. 27).

Cytological characteristics associated with the different growth habits in the dicotyledons, G. L. Stebbins, Jr. (Univ. Calif.). *(Amer. Jour. Bot., 25 (1938), No. 3, pp. 189–198, fig. 1).*—In this study, "205 genera of woody dicotyledons, 151 of herbaceous dicotyledons, and 22 containing both woody and herbaceous species were compared as to basic chromosome number, 52 and 148 of the woody and the herbaceous groups, respectively, as to percentage of polyploidy, and 35, 96, and 17 of the three groups, respectively, as to absolute chromosome size, using data obtained from the published chromosome lists and from numerous publications on particular groups. The basic numbers are significantly higher in the woody group, and there is much less variation in basic number within the same genus. In these respects the genera containing both woody and herbaceous species resemble the strictly herbaceous ones. Polyploid series are most frequent in strictly perennial herbaceous genera and are less frequent in both the strictly annual and the woody groups. The great majority of woody genera have small chromosomes, while the larger

size classes are relatively frequent among herbaceous genera and among those containing both woody and herbaceous species."

Meiotic studies in triploid Tulipa with special reference to bridging and fragmentation, M. W. Woods. (Univ. Md.). (*Bot. Gaz.*, *99* (*1937*), *No. 1*, *pp. 103–115*, *figs. 31*).—The results of studies of microsporogenesis in the triploid cottage tulip Inglescombe Yellow are set forth in detail. The variety behaved cytologically as an autotriploid, 12 trivalents at metaphase I not being rare. In anaphase I, chromosome bridges and fragments sometimes occurred. Lagging univalents, fragments, and portions or all of bridge configurations were often excluded from the daughter nuclei in interphase I. Microspores were generally organized in tetrad form. It was possible to distinguish three different triploid tulip varieties on the basis of the frequency distributions of extra nuclear chromatin bodies in their microspores.

Variegation resulting from unequal mitosis, D. F. Jones. (Conn. [New Haven] Expt. Sta.). (*Genetics*, *23* (*1938*), *No. 1*, *pp. 153*, *154*).—This is an abstract on studies of maize seed.

Plasmatic inheritance, M. J. Sirks (*Bot. Rev.*, *4* (*1938*), *No. 3*, *pp. 113–131*).—This critical review (with three pages of references) emphasizes the thesis that inheritance is not a matter of genes or of plasm alone, but is a process involving both. Examples of the influence of the plasm on inheritance are given for both animals and plants—including seed color in *Matthiola*; chloroplasts in *Oenothera*; vegetative characters in mosses, *Epilobium*, and *Datura*; examples of different types of plasmatic inheritance; and the influence of a foreign genom on the plasm (the last believed to be a still unsolved problem).

The cytological and genetical significance of colchicine, B. R. Nebel and M. L. Ruttle. (N. Y. State Expt. Sta.). (*Jour. Heredity*, *29* (*1938*), *No. 1*, *pp. 2–9*, *figs. 6*).—It is concluded in this preliminary report of studies that colchicine inhibits spindle formation, so that in dividing cells of animals and higher plants cells with doubled chromosome number are formed. As the plant growth progresses, diploid and mixochimeric shoots develop and tetraploids have been obtained by this means in many herbaceous genera. Some genera do not show the effect of polyploidy equally well. Various implications of the findings are discussed.

Mechanism of polyploidy through colchicine, B. R. Nebel. (N. Y. State Expt. Sta.). (*Nature* [*London*], *140* (*1937*), *No. 3556*, *p. 1101*).

Action of colchicine on mitosis, B. R. Nebel and M. L. Ruttle. (N. Y. State Expt. Sta.). (*Genetics*, *23* (*1938*), *No. 1*, *pp. 161*, *162*).—This is an abstract on studies of mitosis in both plants and animals.

The effect of colchicine on microspore mother cells and microspores of Tradescantia paludosa, R. I. Walker. (Univ. Wis.). (*Amer. Jour. Bot.*, *25* (*1938*), *No. 4*, *pp. 280–285*, *figs. 27*).

A mitochondrial study of the germ cell history of the male guinea pig, K. C. Kates (*Ztschr. Zellforsch. u. Mikros. Anat.*, *27* (*1937*), *No. 4*, *pp. 465–491*, *figs. 15*).—Histological study was made of germ cell formation in guinea pig embryos ranging from 5 days postcopulation to 58 days postnatal age. Primordial germ cells were present in the caudal endoderm of 15-day-old embryos. Progressive stages in germ cell formation and degeneration are described. It seemed doubtful if many primordial germ cells were present in the testes after birth, and if present they are eliminated before definitive germ cells are formed.

An analysis of the "pleiotropic" effects of a new lethal mutation in the rat (Mus norvegicus), H. Grüneberg (*Roy. Soc.* [*London*], *Proc.*, *Ser. B*, *125* (*1938*), *No. 838*, *pp. 123–144*, *pls. 4*, *figs. 6*).—A study is reported on the multiple effects of a new lethal gene in the rat which caused death between

birth and 39 days of age. The lethal gene, linked with pink-eye dilution, caused *an anomaly of several cartilaginous structures, eventually resulting in the* development of an emphysema of the lungs.

Some new data on the grey-lethal mouse, H. GRÜNEBERG (*Jour. Genet., 36 (1938), No. 1, pp. 153–170, fig. 1*).—Continuing the above studies, it was noted that the cortex of the thymus undergoes rapid degeneration during the third week of life. The condition of gray-lethals was not changed by injection of thymocrescin, assumed to be the active principle of the thymus gland. Neuralgia of the mandibles and lower lip is considered the cause of the reluctance to suckle. The lack of secondary bone absorption was not due to a reduction in the number of osteoclasts. Deviations from the 3:1 ratio in the percentage of gray-lethals are discussed.

Dominance in poultry: Feathered feet, rose comb, internal pigment, and pile, R. A. FISHER (*Roy. Soc. [London], Proc., Ser. B, 125 (1938), No. 838, pp. 25–48, fig. 1*).—On analysis, six cases of dominance in wild and domestic fowl crosses involving genes for feathered feet, pile (dominant white), and black internal pigment, in addition to barred plumage, crest, and polydactyly, previously described,[2] were found to be incompletely dominant. Homozygotes could be differentiated from heterozygotes, although modifying factors act to give the impression of dominance, as in the case of feathered feet, where at least one dominant modifier operated in the heterozygote. The apparent dominance of bar in the domestic breeds seems due to its association with a factor for black. On the other hand, the bar gene was more nearly recessive than dominant. The dominance of pile was enhanced by its association with the bar and silver genes. The conclusion regarding rose comb was incomplete, but it was thought that this might be a true dominant. Attention is also called to other incomplete dominants in poultry and especially the case of the Blue Andalusian. Apparent dominance is frequently induced by the introduction of other factors in the domestic breeds.

A heritable variation of feather structure in the fowl, D. C. WARREN. (Kans. Expt. Sta.). (*Jour. Heredity, 29 (1938), No. 3, pp. 91–93, figs. 2*).—A *variation in feather structure characterized by a frayed appearance of the* mature flight and tail feathers was found to be inherited as a simple autosomal recessive. There was a considerable shortage of frayed birds in the backcross progeny which was probably due to low viability of the recessives (E. S. R., 73, p. 24).

[Reproduction studies in dairy cattle] (*Kentucky Sta. Rpt. 1937, pt. 1, p. 20*).—Results are briefly presented of studies on delayed conception in dairy heifers and reproductive efficiency in dairy cows.

Investigations on the conservation of bull sperm for the purpose of artificial insemination [trans. title], B. HATZIOLOS (*Ztschr. Zücht., Reihe B, Tierzücht. u. Züchtungsbiol., 38 (1937), No. 2, pp. 199–254, figs. 5*).—Study is reported of the chemical and physical properties of 54 semen samples collected from 24 bulls ranging in age from 1½ to 3½ yr. by the use of an artificial vagina. Different solutions and dilutions were compared for prolonging the life of the sperm, but no solutions preserved motility longer than 72 hr. (attained with a 1:5 dilution in physiological salt solution). By lowering the temperature to near 0° C., motility was preserved in undiluted sperm for more than 10 days. The viability of sperm was reduced by the use of metal containers. In artificial insemination tests with 20 cows, 2 of the animals inseminated with sperm stored for 24 and 48 hr., respectively, became pregnant.

[2] Roy. Soc. London, Phil. Trans., Ser. B, 225 (1935), No. 523, pp. 197–226, figs. 7.

Effective dosages of undiluted semen in artificial insemination of chickens, W. H. BURROWS and J. P. QUINN. (U. S. D. A.). (*Poultry Sci., 17 (1938), No. 2, pp. 131–135*).—In studies of methods of artificial insemination in poultry, intervals varying from three times a week to biweekly were compared for insemination. These results showed that fertility lasted about 10 days. In tests of different dosages of undiluted semen for weekly insemination, it was found that less than 0.05 cc reduced the fertility obtained. Doses of 0.1 cc of undiluted semen were recommended. Widely different results were obtained by experienced and inexperienced operators in collecting the semen and inseminating the hens.

The form of the lactation curve [trans. title], K. NIELSEN (*Ztschr. Zücht., Reihe B, Tierzücht. u. Züchtungsbiol., 39 (1937), No. 1, pp. 9–23, figs. 5*).—Statistical study was made of the lactation curve of 23 cows, mostly of the Swedish red spotted breed at Wiad, Sweden, having a total of 87 lactations, and 30 cows at Bollerup, mostly of the Swedish black spotted breed, with 106 records. The production records were analyzed according to the variation in production records in the same cows and between different cows.

Sexual dimorphism in red-splashed white down color of chicks, J. P. QUINN. (U. S. D. A.). (*Poultry Sci., 17 (1938), No. 2, pp. 170–174*).—Continuing the studies of sexual dimorphism in the down color of Rhode Island Red chicks (E. S. R., 76, p. 612), 1,962 red-splashed white chicks were classified according to the head spots. Among the 525 chicks that were all white, 74 percent were males. The 878 white chicks carrying one red head spot consisted of about equal numbers of the two sexes. There were 335 chicks in the group with two red head spots, of which 34 percent were males. Females were also in greater numbers than males in the groups with three red head spots and with red and black head spots. Down color was unreliable as an indicator of adult plumage color.

Experimentally induced ovulation in dwarf mice, C. M. OSBORN (*Endocrinology, 22 (1938), No. 3, pp. 370–373*).—An average of 4 ova were recovered from 9 of 12 female dwarf mice from 15 to 30 hr. after the last of four injections of a total dosage of from 1.6 to 1.8 g equivalent of follicle-stimulating hormone with a dose of luteinizing hormone equal to 2, 2.5, or 4 percent of one rat unit at the last injection. The dwarf mice are normally sterile and have underdeveloped reproductive tracts.

Criteria for the selection of estrous rabbits: The significance of seasonal factors, M. H. FRIEDMAN (*Endocrinology, 22 (1938), No. 3, pp. 354–359*).—Employing willingness to mate as the criterion of oestrus, no justification for selecting oestrous does on the basis of duration of isolation period or vaginal color was found. The percentage of oestrous does was high in March and April and during the month following parturition.

First estrus in rats in relation to age, weight, and length, E. T. ENGLE, R. C. CRAFTS, and C. E. ZEITHAML (*Soc. Expt. Biol. and Med. Proc., 37 (1937), No. 2, pp. 427–432, fig. 1*).—Determination was made of the correlation between the occurrence of the first oestrus in rats and the age, weight, and body length. In bringing about variations in growth rate, litter numbers were controlled to from 2 to 3, 3 to 4, 4 to 5, and 10 to 11. The closest correlation between the occurrence of the first oestrus and the other characteristics was with body length. Growth rate in one group was accelerated by the administration of yeast, yet the first heat period occurred in all groups when approximately the same body length was reached.

Effect of sodium chloride therapy on oestrous cycle and hypophysis of bilaterally suprarenalectomized rats, S. J. MARTIN and J. F. FAZEKAS (*S

Expt. Biol. and Med. Proc., 37 (1937), No. 2, pp. 369–372).—Administration of NaCl to adrenalectomized rats prolonged life and restored in 55 percent of the cases the normal hypophyseal-ovarian activity, as determined by the recurrence of oestrus and assays of the gonad-stimulating power of the hypophysis.

The relative effectiveness of emmenin, estriol glycuronide, and estriol in the immature and the castrate immature rat, R. R. Greene and A. C. Ivy (*Endocrinology, 22 (1938), No. 1, pp. 28–34*).—As similar vaginal responses were obtained in immature female rats, whether or not the ovaries were removed, it was concluded that emmenin, oestriol glycuronide, and oestriol were not converted by ovarian tissue into more potent oestrogenic substances. Emmenin and oestriol glycuronide were more effective by mouth than by subcutaneous administration, whereas the opposite result was obtained with oestriol.

Studies on hypertrophy, regeneration, and retardation of ovarian weights in growing rats after oestrone injections, F. E. Emery (*Quart. Jour. Expt. Physiol., 27 (1937), No. 1, pp. 17–26*).—Injections of from 1 to 20 rat units of oestrone per day had little, if any, effect on the size of the ovaries and the compensatory hypertrophy of the remaining ovarian tissue in cases where one ovary or parts of both ovaries were removed. The removal of one ovary increased the frequency and duration of oestrus, and rats having half of both ovaries removed were in oestrus a greater part of the time than normals. Oestrone had no effects on the length of the oestrous cycle, but the percentage of time in oestrus was greater in injected groups. The weights of the spleen, liver, and thymus glands were slightly increased by the oestrone administration, whereas other glands, including the pituitaries, were not affected. Evidently the action of oestrone on the pituitaries does not control compensatory ovarian hypertrophy.

Progestin in the pregnant mare, J. Kimura and W. R. Lyons (*Soc. Expt. Biol. and Med. Proc., 37 (1937), No. 2, pp. 423–427, fig. 1*).—Blood, urine, chorion, endometrium, and corpora lutea from pregnant mares, collected from a slaughter house, were assayed for progestin by the use of 2-month-old rabbits primed with oestrin. Good yields of progestin were obtained from the corpora lutea and especially from the secondary multiple corpora developed at about the fourth month of gestation. No progestin was detected in the other tissues. The mare's secondary corpora lutea constitute the best natural source of progestin which has yet been discovered.

Effect of male hormone upon uterine motility and the uterus, S. L. Leonard, V. Sager, and J. B. Hamilton (*Soc. Expt. Biol. and Med. Proc., 37 (1937), No. 2, pp. 362–365, fig. 1*).—In studies with five female rabbits showing normal oestrous rhythm in the motility of the uterus, testosterone propionate was found to disturb or inhibit motility completely with little or no progestational change as occurs when motility was inhibited with progesterone administration. Testosterone also prevented castration atrophy of the uterus.

Action of male sex hormone with and without estrin in the female rat, J. M. Wolfe and J. B. Hamilton (*Soc. Expt. Biol. and Med. Proc., 37 (1937), No. 1, pp. 189–193*).—The daily administration of testosterone propionate with oestradiol benzoate for 10 days to female rats, while inhibiting the stimulating action of the female hormone on the pituitary, only slightly reduced the capacity of the oestrin to stimulate luteinization in the ovary. The male hormone administered alone stimulated luteinization in some females and not in others. Further tests showed that when the male hormone was first given to females in oestrus or metoestrus the corpora lutea were larger than for females treated in dioestrus. In most rats stimulation of the corpus luteum was associated with a thickened vaginal epithelium.

Inhibition of parturition in the rabbit by the injection of estrogenic hormone, G. P. Heckel and W. M. Allen (*Science, 87 (1938), No. 2257, pp. 302, 303*).—Evidently parturition follows destruction of the inhibiting effect of the corpus luteum brought about by ovariectomy or injury to the placenta or fetus (such as 1- or 2-day administration of oestrogen). Continued administration maintains the corpora lutea, and parturition is delayed even though the embryos die.

Assay of progesterone by a new method, H. B. Van Dyke (*Soc. Expt. Biol. and Med. Proc., 37 (1937), No. 1, pp. 11–13*).—A method for assaying progesterone by the uterine response in nonpregnant cats is suggested. The uterus was sensitized with two daily doses of oestrone, followed on the fourth, fifth, and sixth days with one-third of the dose of the progesterone to be tested. The effect of epinephrine on uterine contraction served as the determinant of its potency.

Further evidence for a mammogenic hormone in the anterior pituitary, E. T. Gomez and C. W. Turner (Mo. Expt. Sta.). (*Soc. Expt. Biol. and Med. Proc., 37 (1938), No. 4, pp. 607–609*).—Growth of the duct and lobule-alveolar systems of the mammary glands of castrated rabbits and rats was stimulated by the administration of fresh or dried anterior pituitaries from pregnant cattle. No response was obtained when pituitaries from nonpregnant cattle were administered, although they contained prolactin. The active principle present in pregnant-cattle pituitaries is called mammogenic hormone.

Lactogen content of pituitary glands from rats on vitamin deficient rations, R. P. Reece, C. W. Turner, I. L. Hathaway, and H. P. Davis. (Mo. and Nebr. Expt. Stas.). (*Soc. Expt. Biol. and Med. Proc., 37 (1937), No. 2, pp. 293, 294*).—Studies of the influence of vitamin deficiency on the lactogen content of the pituitaries showed that per gland the lactogen content of vitamin A- and E-deficient rats was as great as in normals. Diets deficient in the B complex and D resulted in a reduced amount of lactogen per gland.

The effect of synthetic androgen upon the gonadotropic potency of the anterior pituitary, J. B. Hamilton and J. M. Wolfe (*Endocrinology, 22 (1938), No. 3, pp. 360–365*).—The administration of testosterone propionate to male and female and castrated rats was found to reduce but not entirely destroy the gonadotropic potency of the pituitaries. This determination was made by grafting the pituitaries into immature female rats. The augmentation of gonadotropic potency following castration was largely but not completely negated.

Additional sources of androgens, M. D. Kritzer and B. Cunningham (*Soc. Expt. Biol. and Med. Proc., 37 (1937), No. 1, pp. 143, 144*).—By extraction 1 bird unit of androgen was found in 560 cc of stallion urine, 652 cc of male dog urine, 77 g of rooster feces, and about 1,000 g of capon feces.

Chick testis weight response to gonadotropic hormone, T. C. Byerly and W. H. Burrows. (U. S. D. A.). (*Endocrinology, 22 (1938), No. 3, pp. 366–369, fig. 1*).—Newly hatched male chicks were found to respond by increased testis weight in 24, 48, and 72 hr. to injections of gonadotropic hormone administered in mare serum and to injections of pituitary suspensions from male chicks. On analysis there was a straight line relation between the logarithm of the dosage and the logarithm of the resulting testis weight.

The antigonadotropic factor: Reversibility of the prolan-antiprolan effect, B. Zondek and F. Sulman (*Soc. Expt. Biol. and Med. Proc., 37 (1937) No. 2, pp. 343–348*).—The possibility of reactivation of prolan and antiprolan released from neutral prolan-antiprolan mixtures was demonstrated. Antiprolan seems to differ from a hormone and ferment, and is considered to be a new kind of factor more analogous to an immune body.

Some properties of the antigonadotropic factor, B. Zondek and F. Sulman (*Soc. Expt. Biol. and Med. Proc., 37 (1937), No. 1, pp. 193–198*).—Studies of th

properties of the antigonadotropic factor showed that in solution it was destroyed at between 70° and 80° C., but not after being heated for 1 hr. at 100° in an acetone dry powder. It was destroyed by an N/10 NaOH solution. It does not dialyze through cellophane and cuprophane membranes.

Mechanism of prolan-antiprolan-reaction in simultaneous and unsimultaneous application of both active principles, B. ZONDEK and F. SULMAN (*Soc. Expt. Biol. and Med. Proc., 37 (1937), No. 1, pp. 198–202*).—Antiprolan was found to inhibit the gonadotropic action of prolan whether administered in separate or simultaneous injections, but it had no effect when administered enterally. The antigonadotropic effect was noticeable 8 days after administration, but it was most effective when mixed with prolan and stored 2 hr. in the incubator prior to use.

FIELD CROPS

The design and analysis of factorial experiments, F. YATES (*Imp. Bur. Soil Sci. [Harpenden], Tech. Commun. 35 (1937), pp. 95*).—A comprehensive survey of the simpler types of design at present available is attempted, and the appropriate methods of analysis are described. Consecutive treatment is accorded factorial designs with factors at two levels only, designs with factors at three levels, with factors both at two and three levels, and with factors at two, four, and eight levels, and various special types such as designs with split plats and their modifications, and designs for varietal trials involving a large number of varieties.

[Field crops experiments in Arizona]. (Partly coop. U. S. D. A.). (*Arizona Sta. Rpt. 1937, pp. 7, 8, 27–34, 40, 41, 44–46, 47–50, 71–77, 89, 90, 91, figs. 4*).—These pages report progress results from research (E. S. R., 78, p. 34) at the station and substations, including variety tests with corn, wheat, barley, oats, grain sorghum, sorgo, and soybeans; variety-date-of-planting tests with oats, barley, and flax; breeding work with alfalfa, cotton, and wheat; comparison of open-pollinated and hybrid corn strains; studies of certain factors, especially soil moisture and spacing, influencing maturity and length of Acala and Pima cotton fibers; studies of physiological and varietal factors affecting seed setting in alfalfa; residual effects on hegari and barley from phosphates applied to alfalfa; range studies concerned with water requirements of several range plants, the best range grasses in Arizona, and fertilizer tests, including an ash analysis of *Bouteloua filiformis;* life history and reproduction of burroweed; and eradication of mesquite on ranges. A list of noxious weeds of the State is presented.

[Field crops experiments in Hawaii], E. Y. HOSAKA, L. D. WHITNEY, C. P. WILSIE, J. C. RIPPERTON, A. W. BURT, M. TAKAHASHI, E. K. AKAMINE, K. KIKUTA, and F. A. I. BOWERS (*Hawaii Sta. Rpt. 1937, pp. 6–14, 16–19, figs. 2*).—Progress is reported briefly from breeding work and fertility studies with sweetpotatoes; varietal, classification, seed production, and mutation studies and fertilizer and cultural experiments with taro; germination, viability, and storage experiments with crop seeds; adaptation studies with forage grasses and legumes; strain tests with Napier and Merker grasses; cutting tests with Napier grass; and a vegetative survey of Hawaiian ranges.

[Field crops research in Florida]. (Partly coop. U. S. D. A.). (*Florida Sta. Rpt. 1937, pp. 35–49, 141, 145, 147–152, 161, 162, 165–167, 168–170, 173–175,*

176, 180, 181, figs. 5).—Continued investigations (E. S. R., 77, p. 37) at the station and substations, for which progress is reported, conducted by F. H. Hull, W. A. Carver, W. E. Stokes, G. E. Ritchey, W. A. Leukel, J. P. Camp, J. D. Warner, R. M. Barnette, A. L. Shealy, R. E. Blaser, A. Daane, R. E. Robertson, F. D. Stevens, T. Bregger, R. R. Kincaid, W. M. Fifield, H. S. Wolfe, and W. F. Ward, included breeding work with corn, sweet corn, oats, Napier grass, sea-island cotton, sugarcane, tobacco, and peanuts; variety tests with corn, sweet corn, oats, rye, grain sorghum, sorgo, sugarcane for sugar and sirup, potatoes, peanuts, cowpeas, soybeans, clover, lespedeza, and vetch and miscellaneous forage and pasture grasses and legumes and cover crops; production tests with ramie and fiber flax, fertilizer tests with corn, oats, potatoes, chufas, peanuts, sugarcane, clover varieties, Dallis grass, carpet grass, and Napier grass; green manure studies; study of the development and deterioration of roots in relation to growth of pasture plants under different fertilizer and cutting treatments; composition factors affecting the value of sugarcane for forage and other purposes; physiology of the blooming of sugarcane; cultural tests with potatoes, corn, oats, and chufas; comparative production of silage crops, including pearl millet, sorgo, Napier grass, and Cayana sugarcane when grown at relatively high fertility levels; cutting tests with grasses; seed storage investigations; germination of tobacco seed after 5 yr. in different types of storage, and tobacco plantbed fertilization; cowpeas and soybeans grown in rotations for summer cover and green manure; and crop rotation studies with corn, cotton, crotalaria, and Austrian winter peas, and corn and runner peanuts rotating with crotalaria and with native cover crops.

Pasture research besides that noted above included the value of centipede grass pastures as affected by soil characteristics and other factors; the effect of fertilizers on the yield, grazing value, chemical composition, and botanical make-up of pastures; eradication of weeds in tame pastures and methods of ridding land of objectionable growths and obstacles; forage nursery and plant adaptation studies and forage and pasture grass improvement; growth behavior and relative composition of range grasses as affected by burning and the effect of burning on maintenance of natural grass stands and upon the establishment of improved grasses; studies of pasture legumes, of Napier grass (*Pennisetum purpureum*) for pasture purposes, and of water pasture; a method of establishing permanent pastures under various conditions; and pasture studies on peat and muck soils.

[**Farm crops research in Iowa**], H. D. Hughes, C. P. Wilsie, P. E. Brown, L. C. Burnett, J. B. Wentz, C. Y. Cannon, E. V. Collins, J. N. Martin, E. L. Erickson, P. M. Nelson, B. Lowe, J. L. Robinson, G. W. Snedecor, F. B. Smith, H. C. Forster, D. W. Thorne, R. H. Porter, I. E. Melhus, C. S. Reddy, W. E. Loomis, W. F. Buchholtz, C. M. Nagel, A. L. Bakke, W. G. Gaessler, A. T. Erwin, N. D. Morgan, G. M. Cox, A. E. Brandt, J. B. Davidson, A. A. Bryan, H. R. Meldrum, C. K. Shedd, M. E. Hutton, R. M. Hixon, M. M. Rhoades, R. W. Jugenheimer, L. W. Forman, J. C. Eldredge, E. W. Lindstrom, and J. M. Aikman (Partly coop. U. S. D. A.). (*Iowa Sta. Rpt. 1937, pts. 1, pp. 53–71, 72, 116–118 120, 121, 123–125, 128, 186, 187, 188, 190, 234, figs. 2; 2, pp. 18, 21, 22, 23–30, 31–36 38–41, 41–44, 47–51, figs. 2*).—Brief reports of progress (E. S. R., 77, p. 180) are again made of breeding work with oats, barley, wheat, soybeans, sweetclover sugar beets, potatoes, and sweetpotatoes; variety tests with oats, wheat, barley flax, alfalfa, red clover (strains), sweetclover, peanuts, sugar beets, soybeans edible soybeans, and sweetpotatoes; adaptation studies with Mukden and Kanr soybeans and Korean lespedeza; variety-cultural experiments with barley; cultural studies with barley, reed canary grass, and with alfalfa on bacteri

wilt-infected soil; fertilizer and green manure tests for sweetpotatoes and muskmelons; a study of experimental design for plats which have been differentiated in fertility by past treatments; a statistical analysis of covariance data for corn; *the effect on alfalfa of spring-burning natural mulch material; effect of* cutting alfalfa and red and alsike clovers at different times; trials of legumes for green manure; tests of commercial cultures for the inoculation of legumes and nonlegumes; fertilizer factors affecting the storage quality of sweetpotatoes; studies of sugar production in sugar beets; propagation tests with sweetpotatoes; *permanent pasture improvement; effects of fertilizers on soil conditions* and plant growth on permanent pastures; study of seed coat structure and environmental factors affecting germination of weed seeds; investigations of impermeability, longevity, dormancy, viability, and germination of seeds; properties and herbicidal action of sodium chlorate mixtures; and storage and translocation in dandelions.

Research with corn proceeding as projects under the Iowa Corn Research Institute, covered in part 2, dealt with the genetic relations of inbred lines; *genetic studies: improving inbred lines by crossing followed by selfing and* sibbing; improvement through the use of inbred lines; growth response of corn hybrids and varieties on soils of different levels of fertility and on various soil types; tests of varieties, strains, and hybrid combinations in different parts of Iowa; the basin method of planting corn; hill spacing of check planted corn; *comparison of single-plant hill spacings; corn production methods and equipment*; the measurement of limiting environmental factors in growth of the plant at different rates and spacings; correlation between composition and strength of stalk; comparative study of the stem and root development of certain varieties of field corn grown in Iowa; translocation gradients in the corn plant and their relation to photosynthesis and yield; maintenance of pure seed sources of improved varieties through field inspection and certification; production and distribution of seed of corn hybrids and of their parents; and breeding and cultural studies with popcorn. Activities also reported on as related to corn production included seed increase of new or improved varieties of field crops; technics used in seed analysis; physiology of field bindweed (*Convolvulus arvensis*); and weed control in growing corn.

[Field crops experiments in Kentucky] (*Kentucky Sta. Rpt. 1937, pt. 1, pp. 10, 11, 32–37, 40, 54, 55–57, 58*).—*Experiments with field crops* (*E. S. R.*, 77, p. 771) reported on from the station and substations included variety tests with corn, oats, and alfalfa; breeding work with corn, wheat, tobacco for low nicotine, red clover, and bluegrass; rotation, fertilizer, seed yield, and curing tests with tobacco; contributing factors to drought injury to corn; fertilizer tests with corn, sorgo, and lespedezas; response of clover, tobacco, and corn to liming; relation of nitrogen content of potato stems to yield; fertilized crop rotations; studies of the relation of soil productivity to red clover failure; chemical analysis of Kentucky bluegrass, orchard grass, and other common grasses; and pasture experiments.

[Field crops experiments in Massachusetts], W. S. Eisenmenger, K. J. Kucinski, W. G. Colby, H. M. Yegian, R. W. Donaldson, L. S. Dickinson, E. Bennett, and C. E. Cross (*Massachusetts Sta. Bul. 347 (1938), pp. 10–13, 15–18, 19, 20, 39, 44, 45, fig. 1*).—*Further agronomic research* (*E. S. R.*, 77, *p.* 771) for which results are reported briefly included cultural studies with tobacco, including cropping systems, spacing, the effect of the preceding crop, the distribution of nitrogen in soils mixed with different plant tissues, and the application of calcium cyanamide to overcome the immediate harmful effects of ligneous tissue; variety trials with corn for grain and silage, potatoes, and alfalfa; comparisons

of hay seeding mixtures; effect of fertilizer ratios on meadows; the effect of time of cutting on yields of alfalfa and the use of potash in preventing winter-killing of alfalfa; pasture fertilizer experiments; a study of the carbohydrates of bluegrass; herbicidal properties of calcium cyanamide; and chemical control of cranberry bog weeds.

[Field crops research in Nebraska]. (Partly coop. U. S. D. A.). (*Nebraska Sta. Rpt. [1937], pp. 10, 14–21, 22, 33, 34, 55, 58, 59, 60*).—Agronomic work (E. S. R., 77, p. 614) reported on from the station and substations included variety tests with winter and spring wheat, corn, oats, barley, grain sorghums, sorgo, alfalfa, sweetclover, soybeans, flax, and Jerusalem-artichokes; breeding work with corn, sorghum, wheat, alfalfa, sweetclover, and potatoes; rotations including sugar beets and other crops; trials of manure at different rates for sugar beets; nutrition of the potato; time of cutting tests with alfalfa varieties; technic for testing sweetclover varieties; seedbed preparation and planting tests with sorghum, potatoes, and sugar beets, and the performance of dry land barley, corn, and potatoes after different crops and fallow; improvement of permanent pastures and native meadows; and weed control of bindweed and other weeds, including a study of the nature of herbicidal toxicity.

[Crop production in Nebraska] (*Nebr. State Bd. Agr. Ann. Rpt., 1937, pp. 165–226, 230–237, 240–277, figs. 18*).—Papers of interest to agronomists presented at the January 5–7, 1937, meeting of the Nebraska Crop Growers' Association at Lincoln included Conservation Ideas, by D. L. Gross (pp. 165–176), Some Basic Soil Fertility and Moisture Facts, by M. D. Weldon (pp. 176–181), Principles and Practices of Hybrid Seed Corn Production, by T. A. Kiesselbach (pp. 197–207), Plans and Seed Supplies for Hybrid Corn Production in Nebraska in 1937 (pp. 207–210) and Who Should Grow Sorghums? (pp. 210–213), both by P. H. Stewart, Buried Treasure, by H. J. Gramlich (pp. 214–216), Pastures for Next Season, by E. F. Frolik (pp. 230–237), and Lessons From Range Management, by M. L. Baker (pp. 240–243) (all Nebr.); The Weather Bureau (pp. 181–187) and Is the Climate of the Great Plains Changing? (pp. 216–226), both by J. B. Kincer, and The Progress of Hybrid Corn in the Corn Belt, by M. T. Jenkins (pp. 187–197) (all U. S. D. A.); Some Basic Facts in Soil and Moisture Conservation, by C. M. Woodruff (pp. 243–252) (U. S. D. A. and Mo.); and Soil Moisture and Crop Yield Relationship, by L. L. Zook (pp. 252–260), Breeding Small Grains to Fit Your Needs, by K. S. Quisenberry (pp. 261–269), and Alfalfas of Yesterday, Today, and Tomorrow, by H. M. Tysdal (pp. 270–277) (all U. S. D. A. and Nebr.).

[Agronomic research in New Hampshire] (*New Hampshire Sta. Bul. 304 (1938), pp. 19–21, 22, 24, 25, 26, 30, 31*).—Work with field crops again briefly reviewed (E. S. R., 78, p. 35) and variously participated in by F. S. Prince, P. T. Blood, T. G. Phillips, G. P. Percival, L. J. Higgins, S. Dunn, and O. Butler included experiments with hay and with legumes on neglected hay lands; a dairy farm rotation on worn-out hay lands; responses of crops in a 3-yr. fertilized rotation of potatoes, oats, and hay; fertilizer placement and liming experiments with potatoes; a silage corn variety test; a test of cyanamide for corn; a fertilizer experiment with legumes in the Connecticut Valley; a top dressing experiment on old pastures and meadows; a comparative study of pasture grasses and legumes pure and in mixtures; and poison-ivy control.

[Field crops research in Rhode Island] (*Rhode Island Sta. Rpt. [1937] pp. 6–9, 12–14, 24, 26, 27*).—These pages report progress results from variety tests with potatoes, soybeans, and lawn and turf grasses; fertilizer experiments with potatoes, millet, soybeans, alfalfa, and lawn and turf grasses including Kentucky bluegrass and varieties and strains of bents; planting test

with Austrian winter peas and potatoes; endurance of grasses and mixtures on an athletic field; residual effects from different levels of fertilizer for truck crops, as shown by yields of potatoes; effects of crops on succeeding crops; response of seven pasture grasses to varying amounts of moisture; breeding work with alfalfa; control of lawn pests, diseases, and weeds; chloropicrin treatments on compost for weed seed control; and seed production of bentgrass varieties and strains.

[Agronomic experiments in South Dakota], A. N. HUME. (Partly coop. U. S. D. A.). (*South Dakota Sta. Rpt. 1937, pp. 7, 8, 9, 10*).—Field crops work (E. S. R., 77, p. 39) reviewed briefly included breeding work with corn, spring and winter wheats, oats, and barley, and with sorghum for low hydrocyanic acid content; and tests of soybean varieties.

***Comparison of legume growth in different soil types at varying acidity* levels**, H. L. HYLAND (*Jour. Amer. Soc. Agron., 30 (1938), No. 2, pp. 111–121, figs. 3*).—When Korean lespedeza, sericea, zigzag clover, and crown vetch plants, which usually grow well on poor, unlimed soils, and red clover and sweetclover plants, which are more responsive to limed soils, were grown at Arlington, Va., in four soil types under greenhouse conditions and at three pH levels, wide variations in growth of the different crops occurred. Sericea was slightly more tolerant of lower pH readings than Korean lespedeza and zigzag clover, which compared favorably with each other. Zigzag clover tended to tolerate a higher alkaline concentration than sericea. Crown vetch failed to grow in a soil of 4.4 pH and gave only a fair growth in the 5.3 pH level. Considering amount of growth normally produced, Korean lespedeza, sericea, and zigzag clover often made relatively more growth than red clover or sweetclover regardless of pH level. Addition of calcium carbonate to a soil with an original pH of 5.10 did not increase significantly the amount of legume growth. Soil pH readings were not found true indicators of the adaptation of different legume crops to such soils. Soil pH usually decreased between the beginning and end of the experiments in all soil types and different pH levels of these types, and the largest decreases occurred where most plant growth resulted and where the largest amounts of lime were added.

A study of the time of pasturing alfalfa, H. C. RATHER and A. B. DORRANCE (Mich. Expt. Sta.). (*Jour. Amer. Soc. Agron., 30 (1938), No. 2, pp. 130–134*).—In further experiments (E. S. R., 72, p. 762), alfalfa was pastured from April 30 to August 28, May 14 to August 28, and from May 14 to October 16, each treatment being carried on in three 1-acre paddocks. Alfalfa pastured in the fall had less dry matter per 100 roots and had developed fewer and much less vigorous crown buds when sampled October 30 and November 28. Electrical conductivity determinations with alfalfa roots indicated that alfalfa not grazed after August 28 had hardened off much better by November 28 than that pastured in the fall regardless of previous treatment. Root starvation caused by fall grazing in September and October and heaving of the dead plants during winter and spring was almost universal in the fall-pastured alfalfa, and in two of three paddocks the stands left in the spring of 1937 were of little use either as hay or pasture. Alfalfa not pastured in September and October showed no indications of winter injury, no heaving was apparent, and excellent stands of vigorous alfalfa were available for continuation of pasture in 1937. See also an earlier note on the effect of late summer and early fall cutting on crown bud formation and winter hardiness of alfalfa (E. S. R., 76, p. 782).

Alfalfa management, with special reference to fall treatment, H. C. RATHER and C. M. HARRISON (*Michigan Sta. Spec. Bul. 292 (1938), pp. 18,*

figs. 7).—Experiments, 1934–37, on the effects of fall cutting treatments on the hay yield of Hardigan alfalfa, on storage of food materials in the roots, on growth and yield in the next spring, and in relation to heaving are reported on. See also the preceding abstract and an earlier note (E. S. R., 76, p. 782).

The safest procedure for a Michigan farmer, as shown by the several experiments, is to cut his alfalfa only twice each season. Cutting or close grazing of alfalfa should be avoided during the critical fall period for any given locality, as shown on an outline map of the State. The crop should make enough top growth in the fall to enable storage of ample quantities of starch in the roots as reserve food to carry the plants through the winter and to initiate vigorous spring growth. Most of the storage in Michigan accumulates during September. If a fall cutting of hay or fall pasturage is needed, least injury will result if alfalfa with its roots well filled with food is cut or pastured late enough in the fall so that cold weather will prevent subsequent growth and resultant depletion of root reserves. On the other hand, if alfalfa to be plowed up is cut or heavily grazed throughout September, plowing the following spring will be less difficult.

Winter barley in Maryland, R. G. ROTHGEB and W. B. KEMP (*Maryland Sta. Bul. 416 (1938), pp. 239–257, figs. 6*).—The acreage and distribution of barley in Maryland; the merits of the crop as feed grain, for straw, for pasture and green forage, and as a nurse crop; cultural and field practices; disease control; and suitable varieties are discussed, together with an account of breeding work and varietal comparisons with barley.

Tennessee Winter has long been the most reliable variety for Maryland, and because of winter-hardiness and productivity still occupies most of the State's acreage, but the disagreeable nature of its awns has restricted its popularity. Marnobarb, Sel. 19–8, and Sel. 15–8, three of the strains with awns practically free from barbs, developed by the station from crosses between Velvet and Tennessee Winter, have outyielded Tennessee Winter in both straw and grain, although somewhat less winter-hardy.

Cooperative production of foundation stocks for certified corn hybrid[s] in Ohio, R. D. LEWIS and G. H. STRINGFIELD. (Ohio Expt. Sta., U. S. D. A. et al.). (*Jour. Amer. Soc. Agron., 30 (1938), No. 2, pp. 145–149, fig. 1*).—[A] planned program for the production of seed of adapted corn hybrids has bee[n] developed in Ohio to the point where, in 1937, 260 growers produced commercia[l] supplies of seed, a group of 320 apprentices was gaining experience with ⅛- o[r] ¼-acre crossing plats, and seed production had been initiated in each of th[e] 88 counties. This research-extension production program is designed to mak[e] available reliable seed of adapted hybrids at a reasonable price. The organiza[-] tion and its methods and advantages are discussed briefly.

Green needle grass, Stipa viridula, for erosion control, B. I. JUDD (*Jou[r.] Amer. Soc. Agron., 30 (1938), No. 2, pp. 160, 161, fig. 1*).—Green needlegra[ss] (*S. viridula*), proving to be a valuable native species for erosion control pu[r]poses in the northern Great Plains, grows under a wide range of soil and c[li]matic conditions, appears to be extremely drought resistant, and is high[ly] palatability. Its characteristics and indicated planting and seed harvest pr[ac]tices are outlined.

The influence of acid and neutral fertilizer mixtures upon the yield [of] potatoes on the limed plats at Onley, Virginia, J. B. HESTER. (Va. Tr[uck] Expt. Sta.). (*Amer. Potato Jour., 15 (1938), No. 2, pp. 35–37*).—A non-ac[id-]forming fertilizer mixture increased the yield of potatoes in 1937 on unlim[ed] plats, but only slightly influenced it on limed plats. Neutral and acid-formi[ng] [...] showed no apparent difference on severity of scab.

Inoculation of sesban, C. F. Briscoe and W. B. Andrews. (Miss. Expt. Sta.). (*Jour. Amer. Soc. Agron., 30 (1938), No. 2, pp. 135–138*).—Rhizobia isolated from *Sesban exaltata* produced abundant and efficient nodulation thereon, garden bean Rhizobia good to abundant nodulation, and cowpea Rhizobia only a few nodules. Sesban inoculated with sesban cultures was increased about 35 percent in yield and about 0.75 percent in percentage of nitrogen. Strains of cowpea and garden bean Rhizobia did not increase the yield or the nitrogen content of sesban significantly.

Proceedings of the seventeenth annual meeting of the American Soybean Association (*Amer. Soybean Assoc. Proc., 17 [1937], pp. 63, figs. 3*).—Papers presented at the meeting of the association held in Urbana, Ill., September 14–16, 1937, included The Research Program of the Bureau of Chemistry and Soils on Industrial Utilization of Farm Products, by H. T. Herrick (pp. 3–9), The U. S. Regional Soybean Industrial Products Laboratory, Urbana, Ill., by O. E. May (pp. 10, 11), Work of the Agronomic and Analytical Divisions of the U. S. Regional Soybean Industrial Products Laboratory, by J. L. Cartter and R. T. Milner (pp. 12–15), and Soybean Variety Studies of the United States Department of Agriculture, by W. J. Morse (pp. 16–18) (all U. S. D. A.); and Edible Varieties of Soybeans, by S. Woodruff (pp. 19–22), Behavior of Soybeans as a Vegetable Crop, by J. W. Lloyd (pp. 23–28), Soybeans and Soybean Products for Beef Cattle and Sheep, by R. R. Snapp (pp. 29–33), Experiments in Time of Harvesting Soybeans for Hay, by W. B. Nevens (pp. 34–36), Soybeans and Soybean Products in Pork Production, by S. Bull (pp. 37–43), Recent Results in Soybean Breeding and Genetics, by C. M. Woodworth (pp. 44–48), What Do We Know About the Fertility Value of Soybeans, by O. H. Sears (pp. 49–51), Changes in Costs and Practices in the Production of Soybeans, by R. C. Ross (pp. 52–57), and Soybean Harvesting Studies, by A. L. Young (pp. 58–62) (all Ill.).

The effect of applications of common salt upon the yield and quality of sugar beets and upon the composition of the ash, J. G. Lill, S. Byall, and L. A. Hurst. (Mich. Expt. Sta. and U. S. D. A.). (*Jour. Amer. Soc. Agron., 30 (1938), No. 2, pp. 97–106*).—Applications (250–1,000 lb. per acre) of common salt to the soil for the sugar beet crop have had a beneficial effect upon the yield of roots, reflected, in many cases, as an increase in calculated sugar production. The salt applications seemed to have a detrimental effect upon the apparent purity coefficient of the juice of the beets, and were found to increase the total amount of ash and to increase the proportions of sodium, chlorine, and possibly potassium in the ash. From the known properties of the chlorine and sodium in the ash, it was judged that any increase in these constituents would interfere in the refining of the sugar and reduce the proportion of the recovered sugar. Indications were that the amount of potash in the ash of the sugar beet juice may have been greater where salt was applied than where no salt was applied or where a potash-bearing fertilizer was used.

Variation in plant production of individual roots and individual hills of the Porto Rico sweetpotato, J. B. Edmond, (S. C. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 590–593*).—Marked variation in plant production, shown by individual roots and hills of Porto Rico sweetpotatoes, was greater in terms of individual roots than of individual hills. The possibility of selecting high plant-producing strains was indicated.

Sweetpotato propagation studies, J. H. Beattie, V. R. Boswell, and J. [M.] McCown. (U. S. D. A. and S. C. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), p. 648*).—Successive beddings of seed stock were made at intervals such that the first pulling from the latest bedding, the second pulling from the second

bedding, and the third pulling from the first bedding would yield supplies uniform sprouts for transplanting on the same day. Sprouts from all th pullings appeared to be of equal productivity if of comparable size when pul and all planted at the same time. Sprouts from 6 to 7 in. long produced yie and grade percentages not significantly different from sprouts from 9 to 10 long and otherwise of equal vigor and quality.

Methods of scarifying sweetpotato seed, C. E. STEINBAUER. (U. S. D. . (*Amer. Soc. Hort. Sci. Proc., 34 (1937). pp. 606-608*).—Scarification tests volving 15 treatments indicated that for treating lots of a fair number of se soaking for 20 min. in concentrated sulfuric acid followed by thorough wasl with water is to be recommended. With a small number of seeds in a sar where the acid treatment is not convenient, filing the seed coats on the term or cotyledonary end, or on the angular or partially flattened side mid between the ends of the seed, or on the funicular end will give satisfac results.

Wheat production in Indiana, A. T. WIANCKO and C. E. SKIVER (*Ind Sta. Circ. 237 (1938), pp. 14, figs. 8*).—Practical recommendations on gro winter wheat, based extensively on station research, deal with the soil ad: tion and place of wheat in the rotation; varieties; seed selection, prepara and storage; cultural methods and field practices; and harvesting with combine.

Chemical weed killers, III–V (*Canad. Jour. Res., 15 (1937), Sect. C, N pp. 442–449; 10, pp. 451–460; 11, pp. 520–537, figs. 4*).—Three additional p (E. S. R., 78, p. 334) are presented.

III. *Relative toxicity of several chemicals to perennials under field condi* W. H. Cook, T. K. Pavlychenko, J. M. Manson, and P. Garrow.—Only 5 chemicals applied to perennial weeds over the same range of dosages app to have a useful toxicity as judged by the number of living plants 1 yr. treatment. The effective chemicals could be grouped according to their to: as (1) sodium chlorate, (2) barium chlorate and arsenic pentoxide, an ammonium thiocyanate and sodium arsenite, and the relative toxicity ‹ three groups judged from the certainly lethal dosage was in the propc of 1 : 1.5 : >2.

IV. *Relative toxicities and loci of absorption of selected chemicals app perennials,* W. H. Cook.—Twelve chemicals previously found to be highl; to annual weeds were applied to perennial sow thistle (*Sonchus arven.* the foliage only, to the soil only, and to both the soil and foliage. The c! ion was found to be the most toxic, although sodium selenite, ammoniu cyanate, sodium dichromate, and sodium arsenite were all reasonably effe‹ higher dosages. No other chemical caused any significant permanent re in growth at the dosages used. The permanent effect of a treatment a; due almost entirely to the action of the chemical in the soil, and the tiveness of certain chemicals could be attributed to their rapid detoxica the soil. Although all the chemicals exert a temporary and sometimes ; permanent effect when applied only to foliage, this method of applicati erally is ineffective due to the inability of leaves and stems to retain or a lethal dosage.

V. *Relative toxicity of selected chemicals to plants grown in culture ; and the use of relative growth rate as a criterion of toxicity,* W. H. Coc substances found earlier to be highly toxic when applied to annuals as were also very toxic when added to culture solution. Results by methods did not agree as far as the less poisonous chemicals were co certain substances being comparatively more toxic in culture solution tl

spray, and vice versa. An explanation of the discrepancies was that the dosage in culture solution was varied by adjusting the concentration, whereas it was varied in the spraying test by altering the spray volume. Time between treatment and death of the plant generally decreased as the dosage was increased over a limited dosage range, but varied with different chemicals and appeared to be independent of their inherent toxicity.

The size of the plant was reduced seriously at dosages producing no mortality. The final weight was deemed unsatisfactory as a criterion of toxicity since it was extremely variable. The interfering factors affecting the final weight were taken into account by computing the relative growth rate. On the average, complete mortality occurred at a growth rate of −2.44 percent per day under the conditions, but this was subject to variation due to differences between duplicates, chemicals, and series.

Analyses of culture solutions containing chlorates showed that the amount of chlorate taken up by the plant increased with the concentration in the culture solution. However, only a small, relatively constant proportion of the chlorate present was taken up by the plant at all concentrations.

The chemical eradication of lawn weeds, J. H. Hanley and F. F. Weinard. (Ill. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 845–849*).—Ethyl 9-acetoxy-mercuri-10-methoxy-stearate, i. e., mercurated ethyl stearate, was found to be an efficient herbicide and superior to iron sulfate, copper nitrate, and ammophos in this respect. Dandelion, large-leaved and narrow-leaved plantains, and crabgrass could be killed if sprayed at the proper time of year and with optimum concentration.

For the average lawn the optimum concentration is 3 cc per liter with the effective range lying between 2 and 5 cc per liter, and best results are obtained by using kerosene or one of its fractions as the solvent. Spring and fall applications are less effective than those during the drier summer. Moist sites require higher and dry sites lower concentrations. An average rain does not materially reduce the efficiency of the stearate, and some evidence suggests the desirability of watering following application if the season is too dry. Late afternoon and evening sprayings are somewhat more effective. Greatest efficiency developed on areas where grass and weeds were cut short, for if they were too high, as on unmowed areas, penetration to the root was too difficult.

HORTICULTURE

[Horticultural investigations by the Arizona Station] (*Arizona Sta. Rpt. 1937, pp. 41–44, 46, 47, 56–65, fig. 1*).—Progress of the following studies is discussed: Comparative resistance of ornamental plants to freezing; breaking of the dormancy of lettuce seed; fertilizers for lettuce; improvement of lettuce by selection; shipping of cantaloups; development of the pecan nut; causes of excessive dropping of immature pecans; comparison of date varieties as to time of bloom, ripening, and decay; association of crude fat in date skins with losses; response of date varieties to freezing; effect of the 1937 freeze on citrus; and the fertilization and irrigation of citrus.

[Horticultural studies by the Florida Station], E. R. Purvis, R. W. Ruprecht, G. H. Blackmon, R. D. Dickey, F. S. Jamison, A. L. Stahl, J. C. Cain, R. J. Wilmot, J. H. Jefferies, A. F. Camp, W. B. Shippy, A. Daane, R. E. Robertson, F. D. Stevens, H. S. Wolfe, and W. M. Fifield (*Florida Sta. Rpt. 1937, pp. 67, 68, 78–82, 84–92, 96, 126, 127, 129, 130, 140, 141, 171, 172, 173, 175, 176, 177, fig. 1*).—Included are brief reports on cultural, fertilizer, and varietal studies with pecans and the development of pecan products; propagation, plant-

ing, and fertilizer tests with tung oil; culture of *Ilex rotunda*; fertilizer studies with vegetables; relation of nitrogen absorption to food storage, growth, and reproduction in the pecan; variety tests with blackberries, avocados, and peaches; preservation of citrus juices and pulp; cold storage of citrus; maturity of citrus; relation of soil reaction to the growth and yield of vegetables; breeding and selection of vegetables; fertilizer studies with celery; effects of green manures on vegetables; fumigation of horticultural crops; and storage of Easter lily bulbs.

Studies at the Citrus Substation include citrus progeny and bud selection, variety testing and breeding, and soil and fertilizer management of citrus orchards.

Everglades Substation studies reported include soil fertility investigations with truck crops, and effect of water table level on peas and beans.

The following Subtropical Substation projects are discussed: Comparisons of windbreak species, rootstocks for citrus, varieties of avocados, carrots, and sweet corn, testing of new hybrid tomatoes, testing of miscellaneous plant materials, and fertilizers for the tomato.

[Horticultural studies by the Hawaii Station] (*Hawaii Sta. Rpt. 1937, pp. 14–16, 19–26, 27–34, 48, 49, figs. 5*).—Among studies reviewed are sweet corn breeding; chromosomal counts on papaya and passion fruit; anatomical structure of macadamia nuts and buds; improvement of the papaya and macadamia by breeding and selection; breeding of tomatoes and lettuce; testing of fruit and vegetable varieties; and yield response of coffee to fertilizers.

[Horticultural investigations by the Iowa Station] (*Iowa Sta. Rpt. 1937, pts. 1, pp. 156, 157, 173–186, 187, 188, 189, 190, 191, figs. 4; 2 pp. 36, 41*).—Among studies reviewed in part 1 are the inheritance of fruit size and shape in the tomato, by E. W. Lindstrom; varieties of peony and iris, by E. C. Volz; propagation of the apple, by T. J. Maney and B. S. Pickett; soil management in the apple orchard, by Pickett and Maney; storage temperatures for apple varieties, by H. H. Plagge; apple breeding, by H. L. Lantz, Pickett, and Maney; pear breeding, by Pickett and Lantz; plum breeding, by Pickett, Lantz, and Maney; breeding of hardy peaches, by Maney, Lantz, and Pickett; varieties of apples, by Lantz, Pickett, and Maney; breeding of anthracnose-resistant black raspberries, by Maney; propagation of erosion-control plants, by Pickett and V. T. Stoutemyer; respiration cycle in stored Jonathan apples, by Plagge; strawberry varieties and fertilizers for southeastern Iowa, by Maney and Pickett; stock and scion studies with the apple, by Maney; propagation of woody plants, by Pickett and Stoutemyer; asparagus culture, by A. T. Erwin and E. S. Haber; testing of wilt-resistant watermelons, by Erwin; factors affecting the quality and marketing of cantaloups, by Erwin and G. S. Shepherd; varieties of vegetables, by Erwin and Haber; varieties of muskmelons, by Erwin and N. D. Morgan; and temperature and moisture requirements of asparagus by Haber.

In part 2 brief mention is made of the progress of experiments in sweet corn breeding and on the nature of drought resistance in inbred and hybrid lines of sweet corn, both by Haber.

[Horticultural investigations by the Kentucky Station] (*Kentucky Sta. Rpt. 1937, pt. 1, pp. 37–39, 42, 57, 58–60*).—Herein are discussed the results of variety trials with fruits and vegetables, propagation of the apple, mulching of red raspberries, autumn fertilization of peaches as related to soluble nitrogen and phosphate phosphorus in the dormant twigs, relation of soluble nitrogen and phosphate phosphorus in tomato leaf petioles and the stems of sna[illegible] ... watering of greenhouse benches, drainage [illegible]

[**Horticultural studies by the Massachusetts Station**], W. G. COLBY, H. M. YEGIAN, L. H. JONES, E. BENNETT, C. I. GUNNESS, H. J. FRANKLIN, C. R. FELLERS, H. E. WHITE, A. S. LEVINE, W. B. ESSELEN, JR., R. M. KOON, G. GRAVES, H. S. TIFFANY, G. B. SNYDER, W. L. LACHMAN, A. P. TUTTLE, P. W. DEMPSEY, R. E. YOUNG, H. A. WILSON, J. K. SHAW, L. SOUTHWICK, A. P. FRENCH, J. S. BAILEY, R. A. VAN METER, O. C. ROBERTS, and G. G. SMITH (*Massachusetts Sta. Bul. 347 (1938), pp. 14, 15, 29, 30, 41, 45, 70–72, 74, 76–88*).—Among studies the progress of which is reviewed are onion breeding; effect of soil temperature on gardenias; soil temperature as an important ecological factor in greenhouses; root development of hardened plants; effect of storage and processing on the carbohydrates of onions; cold storage of cranberries; relation of season of ripening to the keeping quality of cranberries; breeding snapdragons; effect of plant nutrients, soil reaction, and light on gardenias; propagation of gardenias and geraniums; effect of forcing on lilies; storage and composition of cranberries; varieties and culture of the aster; handling of hardy plants; propagation of clonal apple stocks; varieties of hardy herbaceous ornamentals; varieties of vegetables; water requirements of tomatoes; vernalization of vegetable crops; shape index in the tomato; varieties and culture of asparagus; storage of Pascal celery; trellising of tomatoes; breeding of vegetables; influence of clonal rootstocks on the apple; tree characters of fruit varieties; genetic composition of peaches; cultural, fertilizer, and varietal studies of fruits; fruit bud formation in the strawberry; storage of the apple; spray materials and residues; blueberry culture and nutrition; premature dropping of the McIntosh apple; and factors in the coloring of apple fruits.

[**Horticultural studies by the Nebraska Station**] (*Nebraska Sta. Rpt. [1937], pp. 21, 27, 28, 29–33, 55, 56, 59*).—Brief progress reports are presented on the following studies: Pyrethrum culture; cultural systems in the orchard as related to yield, apple size, soil moisture supply, etc.; supplemental water for orchards in eastern Nebraska; soil moisture requirements of asparagus; testing of yellow sweet corn hybrids; varieties of tomatoes; irrigation of vegetables; soil management of vegetables; tree and shrub trials at the North Platte Substation and the testing of buffalo and blue grama grasses for lawns; and at Scottsbluff Substation, optimum winter planting dates with peas, carrots, parsnips, and onions.

[**Horticulture at the New Hampshire Station**] (*New Hampshire Sta. Bul. 304 (1938), pp. 10–18*).—Studies the progress of which is discussed are the relation of fall applications of nitrogen to winter injury in the apple, by G. F. Potter, W. W. Smith, M. A. Tingley, and T. G. Phillips; effect of sulfur sprays and of fruit thinning on blossom bud formation in the apple, by Potter and L. P. Latimer; effect of type of crate on the rate of cooling of apples, by Smith; pollination of the apple; fertilizers for the apple, peach, and strawberry, by Potter and Latimer; varieties of strawberries, apples, and vegetables, by Latimer, Potter, and J. R. Hepler; selection and propagation of the blueberry, by Latimer, Smith, and Tingley; and transplanting of shade trees, by H. S. Clapp.

[**Horticultural investigations at the Rhode Island Station**] (*Rhode Island Sta. Rpt. [1937], pp. 10–12, 15–20, 24, 25*).—Included are reports upon studies of fertilizer requirements of vegetables; strain and variety tests with vegetables; seed and soil treatments; use of growth-promoting substances as aids in propagation of daphne and yew; culture of *Lilium formosanum;* carbon dioxide assimilation of apple leaves as influenced by position on the tree and by spray materials; influence of spraying on the tomato; spacing of strawberry plants; relation of time of picking and of oiled paper on the incidence of scald in Rhode

Island Greening apples; relation of time of picking apples to size; breeding of thornless blackberries; nutrient needs of the blueberry; and influence of intercrops and of fertilizers on the growth of rhododendron seedlings.

[**Horticultural studies by the South Dakota Station**], N. E. HANSEN, F. J. LEBLANC, and T. R. WRIGHT (*South Dakota Sta. Rpt. 1937, pp. 26–30*).—Among studies reviewed are breeding of fruits and roses, especially the improvement of the sand cherry, and the culture of several varieties of *Chenopodium*.

Tomato variety trials at Ames, Iowa, in 1936, E. S. HABER. (Iowa Expt. Sta.). (*Iowa State Hort. Soc. Rpt., 71 (1936), pp. 280–283*).—Yield data with comments on the more promising varieties are presented as a result of trials of many new varieties in 1935 and 1936.

Studies of the tomato in relation to its storage.—I, A survey of the effect of maturity and season upon the respiration of greenhouse fruits at 12.5° C., E. J. M. WALFORD (*Canad. Jour. Res., 16 (1938), No. 2, Sect. C, pp. 65–83, figs. 38*).—Grand Rapids tomatoes were grown in the greenhouse at different seasons, individual fruits were picked at various stages of maturity, and continuous records were taken on their respiration at 12.5° C. (54.5° F.). The fruits of the late spring and summer went through the customary series of changes in respiration rate as they ripened, and exhibited the lack of durability usual in the tomato. In contrast, the fruits of the late autumn, winter, and early spring, when picked before the external appearance of red pigment, passed into a stable state in which ripening proceeded with but little change in respiration rate and with greatly enhanced duration of life at 12.5°.

The winter hardiness of some woody plants, H. E. KNOWLTON. (W. Va. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 660–663*).—A record is presented of the amount of flower bud injury experienced by a large number of ornamental and fruit plants growing near Morgantown when exposed to a rapid drop in temperature on January 23, 1936, from 50° to —16° F. in 12 hr. Wood injury to a large number of peach varieties is recorded, with comments on fruits such as the apple and red raspberry. Injury to fruit in the northern panhandle and near Reedsville is also recorded, and the nature of injury and contributing factors are discussed.

Cyclopedia of hardy fruits, U. P. HEDRICK (*New York: Macmillan Co., 1938, 2. ed., pp. IX+402, pls. 14, figs. 350*).—This is an enlarged edition of the previously noted text (E. S. R., 48, p. 443).

Photoelectric measurements of apple leaf areas, G. F. POTTER (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 260–262, figs. 3; also New Hampshire Sta. Sci. Contrib. 63 [1938], pp. 260–262, figs. 3*).—A brief account is given of the structure and operation of an apparatus devised to measure rapidly and accurately the area of apple leaves.

Availability to apple trees of potassium applied on the surface of sod mulch orchards in New Hampshire, G. F. POTTER and G. P. PERCIVAL (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 335–338, fig. 1; also New Hampshire Sta. Sci. Contrib. 64 [1938], pp. 335–339, fig. 1*).—Studies in four orchards indicated a downward movement of K detectable even in the first season after application. In one case it appeared that the K reached the 6–8 in. layer. In one orchard there were observed many fine roots extending upward to the surface of the soil beneath the mulch, indicating direct contact of the K with at least part of the roots. Tests of leaf petioles showed higher K in the K-treated trees indicating an increased absorption. A type of leaf scorch observed in some trees was not affected by K, suggesting that K deficiency was not directly concerned. In no orchard were yield differences sufficient to be statistically significant.

Observations on topworking with certain apple varieties, S. W. EDGECOMBE and H. L. LANTZ. (Iowa Expt. Sta.). (*Iowa State Hort. Soc. Rpt., 71 (1936), pp. 111–116, figs. 4*).—Observations at Mitchellville where Turley, Jonathan, and Stayman Winesap trees were growing alternately on their own trunks and top-worked on Hibernal, showed considerably more injury following the very cold winter of 1935–36 to the trunk and crotches, leaf and fruit buds, and terminal shoots of the trees on their own trunks. There was no crotch injury on the trees on Hibernal stocks. Yield records taken on some McIntosh, partly on their own trunks and partly on Hibernal, showed much larger yield on Hibernal.

Case history of two winter injured Baldwins, M. A. TINGLE (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 135–137, figs. 2; also New Hampshire Sta. Sci. Contrib. 61 [1938], pp. 135–137, figs. 2*).—Herein are presented observations on the nature of injury to two trees, the least injured and an average tree, in a Baldwin orchard almost completely destroyed as a result of a minimum temperature of −31° F. on December 30, 1933. The comparative scarcity of frost rings in Baldwin, a variety of little resistance to extreme temperatures, led to the conclusion that the absence of such rings is not necessarily an index to varietal hardiness.

The occurrence of seedless apples as a result of frost, L. P. LATIMER and C. O. RAWLINGS (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 111–115, fig. 1; also New Hampshire Sta. Sci. Contrib. 62 [1938], pp. 111–115, fig. 1*).—Observations following late spring frosts occurring about 3 days after the calyx spray showed a large percentage of seedless fruits on frost-exposed Wealthy trees and fruits with one or more seeds in the McIntosh variety. The seedless Wealthies were well shaped but exceptionally large, rather low in color, and developed moldy cores in considerable number. The barely visible, brown, shriveled ovules indicated death of the embryo at an early stage.

Marbling of pear leaves [trans. title], H. WENZL (*Gartenbauwissenschaft, 11 (1938), No. 5, pp. 621–626, figs. 4*).—Stating that variegation has often been observed in the leaves of the apple, quince, mahaleb cherry, medlar, and service tree, but rarely in the pear, the author reports the occurrence of marble-like variegation in the leaves of the Gellert pear. Five adjacent trees in a row of 2-year-old nursery stock showed white streaking of the leaves but were otherwise similar to the normal in growth. Microscopic examination of the white and green portions of the leaves showed a sharp demarcation of the tissues. No colorless plastids could be found in the chlorophyll-free cells. The author believes that it was a case of bud mutation with the offtype trees propagated from the same parental branch. Continued observations on 25 normal leaves on variegated trees failed to show any change during the growing season, indicating no reversion of the chloroplasts after growth had begun in the spring.

Handling and preparing the Kieffer pear for use as food, C. W. CULPEPPER, J. M. LUTZ, and H. H. MOON (*U. S. Dept. Agr., Farmers' Bul. 1796 (1938), pp. II+16, figs. 8*).—General information is presented on the ripening, storage requirements, and utilization of Kieffer pears. Fruits testing from about 13 to 14 lb. with the Magness and Taylor pressure tester applied to the pared surface are considered at about the right stage for harvesting. Maximum development of flavor and the best texture were obtained with fruits stored for from 2 to 3 weeks at about 60° to 65° F. for final ripening. If held at lower temperatures for some time, the pears required placement at from 60° to 65° for their final ripening period. The storage room required proper ventilation and a relative humidity of about 85° to 90°. The chemical composition of fruits as influenced by degree of maturity and by the storage temperatures is discussed.

Quince growing, H. P. Gould (*U. S. Dept. Agr. Leaflet 158 (1938), pp. 4*).—This is a presentation of general information.

Fruitfulness in stone fruits [trans. title], H. Kühlwein (*Gartenbauwissenschaft, 11 (1938), No. 5, pp. 614–620, figs. 2*).—Stating that the introduction of new varieties has necessitated a renewed study of pollination, the author reports that in the new plum Lützelsachser pollen germination in 2 and 5 percent sucrose solutions averaged 61.9 and 64.2 percent, respectively, while at 10 percent, germination dropped to 49.2 percent. Insertion of stigmatic tissue of the Lützelsachser in the sucrose solutions was of no material value in the case of Tragedy, Rivers Early, and Ruth Gerstetter pollens, but did produce outstanding results in the case of Wangenheim. No fruit resulted from crosses of Lützelsachser × Zimmer and Ruth Gerstetter, but good sets were secured with Tragedy and Ersinger. Self-pollination was a complete failure. In the case of Lützelsachser trees budded on *Prunus myrobalana* and St. Julien, the trees differed greatly in size and abundance of flowering, but there were no significant differences in fruitfulness relationships. Where apple trees were planted in a field of mustard, honeybees visited the mustard in great numbers and greatly neglected the apple blooms.

Varieties and fertility relationships in the peach [trans. title], A. Jahn (*Gartenbauwissenschaft, 11 (1938), No. 5, pp. 573–596, figs. 11*).—Continuing the observations of Brauscheidt (E. S. R., 70, p. 625), the author classifies the flowers of 53 peach varieties into four groups, (1) large rose form, (2) small rose form, (3) large bell form, and (4) small bell form. No correlation was apparent between the time of blooming and the time of ripening fruits. Various other characters are discussed as to their use in varietal classifications. In the case of 20 F_2 seedlings derived from the same parental tree and grown as a single group, 19 compared closely with the parent as to flower characters, while 1 differed decidedly. Pollen viability was zero in the odd tree, and uniformly excellent in the 19. When the flowers of each tree were selfed and cross-pollinated with the Sieger variety, the single odd tree set no fruit, and 2 others failed to set fruit from cross-pollination, suggesting the possibility of cross-incompatibility.

Growing strawberries in Missouri, T. J. Talbert (*Missouri Sta. Circ. 19[illegible] (1938), pp. 26, figs. 10*).—This is a presentation of general information relatin[g] to varieties, culture, harvesting, marketing, etc.

Factors influencing the quality of American grapes in storage, J. M. Lutz (*U. S. Dept. Agr., Tech. Bul. 606 (1938), pp. 27, figs. 13*).—Stored for th[e] most part in 4-qt. baskets without washing, grapes kept with the least sha[t]tering and decay at 32° F. Both shattering and decay increased as the rel[a]tive humidity increased, but because of shriveling at low humidities a pe[r]centage of from 80 to 85 appeared most satisfactory. Loss of weight w[as] correlated directly with temperature and inversely with relative humidit[y]. With containers so arranged as to allow free circulation of air, 22, 29, a[nd] 39 hr., respectively, were required to cool the centers of 4-, 16-, and 32-q[t.] baskets from 70° to 31°, the storage temperature. Washing fruits general[ly] caused a slight increase in decay. Treatment with sodium bisulphite result[ed] in decreased decay and shattering, but the practicability of its use is que[s]tioned because of injury hazard and the fact that grapes kept satisfactorily [at] 32° without treatment. There were observed great differences in the keepi[ng] quality of different varieties, with Agawam, Brighton, Eumedel, Lindley, a[nd] Urbana among the best keepers. Temperature had a profound influence [on] respiration of Concord grapes, the output of CO_2 increasing from 2.74 mg [per] kilogram-hour at 32° to 38.55 mg at 80°. The refractometer gave a cl[e]

approximation of the sugar content of the juice. The most significant effect of storage was a loss in acidity at higher temperatures. There was a slight increase in solids and acids at low temperatures, due, apparently, to water loss. During ripening on the vine, grapes increased in solids and decreased in acid content. Practical recommendations include careful handling, the removal of cracked berries, and the use of baskets of 12-qt. size or less.

Chemical changes of fruits ripened in the presence of ethylene, E. HANSEN. (Oreg. Expt. Sta.). (*Science, 86 (1937), No. 2229, p. 272*).—Pears picked and treated, while still containing starch, with ethylene had more reducing and total sugars and less starch than untreated fruits. Ethylene accelerated also the rate of pectic changes occurring in the cell walls of the pear, gooseberry, peach, and Ponderosa lemon rind. Evidence was secured that the softening changes in fruits, often described as physical in nature, are essentially chemical changes that may be influenced by ethylene.

The cold storage of Nagpur oranges (Citrus aurantium), G. S. CHEEMA, D. V. KARMARKAR, and B. M. JOSHI (*Indian Jour. Agr. Sci., 7 (1937), No. 1, pp. 168–175*).—Studies at Poona, India, with Nagpur oranges graded according to color and stored at 35°, 40°, 45°, and 52° F. and at room temperature (from 77° to 90°), showed that fully ripe yellow fruit could be kept in good condition for 3 mo. at 40° without appreciable wastage. Green and turning fruits, although taking on good color at 45° and 52°, lost their juice during storage. At 35° and 40° fruits of all three lots developed internal break-down after varying periods, while at 45° and 52° there was appreciable wastage due to *Alternaria*. Prestorage treatments with various antiseptics, such as copper sulfate, potassium permanganate, and borax, were of no particular significance.

Propagation of the Fuerte avocado by means of leafy-twig cuttings, A. R. C. HAAS (*Calif. Avocado Assoc. Yearbook, 1937, pp. 126–130, figs. 2*).—Stem cuttings of the Fuerte avocado, from 6 to 12 in. long and bearing from three to five mature leaves, were treated with α-naphthaleneacetic and indole-3-acetic acid dissolved in lanolin, and also with a solution of 0.05 percent indole-3-acetic acid. The cutting developed callus but no roots, and, in certain concentrations, showed distinct injury. Water extracts of the macerated roots of Mexicola seedlings injured Fuerte cuttings and had no stimulative influence on rooting. Cuttings grafted on piece roots of a Mexicola seedling produced scion roots above the graft. Considerable success was secured in rooting untreated leafy-twig Fuerte cuttings taken in February.

Further progress in the rooting of Fuerte avocado cuttings, A. R. C. HAAS (*Calif. Avocado Assoc. Yearbook, 1937, pp. 130–132, figs. 2*).—Taking Fuerte cuttings at weekly intervals from October to August, the author obtained ready rooting in lots from late December into the early spring months. The occasional addition of nutrients to the sand in the propagation chamber was highly beneficial in promoting the development of Fuerte cutting plants.

Effect of fertilization, ringing, blossoming, and fruiting on the nitrogen content of avocado leaves, S. H. CAMERON and J. BIALOGLOWSKI (*Calif. Avocado Assoc. Yearbook, 1937, pp. 142–148, figs. 3*).—Nitrogen determinations upon leaves collected periodically from October 1934 to July 1937 from trees receiving liberal applications of nitrogen fertilizer, from straw-mulched trees, and from controls failed to show any consistent differences. It is pointed out that the orchard had been well fertilized prior to the study and that it is likely that differences may appear in the future. Observations on leaves collected during the blooming period in two varieties showed a gradual reduction in nitrogen, apparently due to withdrawal for the blossoms. Prior to the annual spring shedding, there was a very rapid reduction in dry matter and nitrogen in Fuerte

leaves. The ringing of 2-in. branches on November 1 resulted in an apparent reduction in the nitrogen content of leaves beyond the ring. The early removal of fruit of a heavy crop from both girdled and nongirdled branches resulted in a reduction of the green color of the leaves. The presence or absence of fruit on a tree did not appear to influence directly the nitrogen content of the leaves.

Distribution of inorganic constituents in avocado fruits, A. R. C. Haas (*Calif. Avocado Assoc. Yearbook, 1937, pp. 133–139*).—Data are presented, largely in tabular form, on the inorganic composition of the pulp in the stem and tip halves of the fruit of several varieties grown under different environments.

Oil variations of tung trees, T. A. Pickett and W. L. Brown (*Georgia Sta. Circ. 115 (1938), pp. 8*).—Data presented on the precentage of oil content of tung-oil nuts collected from single trees showed considerable variation between the trees and in a single tree from year to year. Quality of oil as determined by the iodine number varied also, ranging in 1936 from 157.1 to 167.3, with most of the oils above 163.

Preliminary studies on flower bud differentiation in relation to photoperiodic response, C. Link. (Ohio Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 621–623*).—On July 20, 1936, 240 Silver Sheen chrysanthemum plants were divided into two lots and one-half shaded from 5 p. m. to 7 a. m., leaving a 10-hr. day. Daily microchemical tests made on fresh tissue of the tip and stem of both lots showed very little difference in the protein and ammonium contents, either in tip or stem. Reducing sugars were more abundant in the tip and stems of the nonshaded plants at the time of bud initiation than the shaded. Nitrates in the stems of the shaded plants dropped at 10 days after shading and remained low until the bud became visible, when they increased rapidly with the application of sulfate of ammonia. Nitrates were absent in both normal and shaded plants at flower bud initiation. Starch was absent or present in extremely small amounts in tip and stem at the time of flower bud initiation in both series. Anatomical studies indicated that the flower buds are initiated in the chrysanthemum at from 6 to 8 days after shading is begun.

Effect of excess fertilizers on roses, snapdragons, and chrysanthemums, K. Post and R. S. Bell (Cornell Univ.) (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 644, 645*).—In greenhouse experiments sulfate of ammonia in excess caused severe wilting of snapdragons and chrysanthemums and yellowing of the leaves of the rose. Excess nitrate of soda caused defoliation in the rose, dead areas in the leaves of the snapdragon, and chlorotic areas in the leaves of the chrysanthemum. Excess potash caused the margins of the young rose leaves to become reddish brown, snapdragon leaf petioles to wither, and a slight stunting of chrysanthemum plants. Excess superphosphate caused no leaf injury in the rose, killed the terminal growth of the snapdragon, and had no apparent harmful effect on the chrysanthemum.

A preliminary report on the respiration of Souvenir gladiolus corms before and after curing at various temperatures, T. M. Whiteman. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 612–617, fig. 1*).—Corms grown at Arlington Farm, Va., in 1936 and dug on October 20 and placed in common storage for 3 days were studied as to respiration at 32°, 36°, 40°, 50°, 60°, 70°, and 80° F., with respective relative humidities of 85, 85, 70, 75, 50, 40, and 40 percent. There was a general tendency for the rate of respiration at 60°, 70°, and 80° to drop off rather rapidly. At 32°, 36°, and 40° there was a gradual decrease. Where corms were held at the above temperatures until November 30 and then all placed in 70°, there was a very sharp increase in the respiratory rate in those held previously at 32°, 36°, and 40°. Apparently at the lower temperatures corms did not cure properly, while at 60° and above curing

Influence on grass growth of various proportions of peat in lawn soils, L. E. Longley. (Minn. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 649–652*).—The incorporation of peat moss into the lawn before seeding was found to depress germination of the grass seed unless the soil was well moistened. The decreased germination was, however, offset by the greater growth and stooling of the plants. A layer of 2 in. of peat was sufficient, more resulting in a soft, spongy lawn surface.

Fertilizer trials with shade trees in the nursery, L. C. Chadwick. (Ohio State Univ.). (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 664–668*).—In this further report (E. S. R., 74, p. 348), the author suggests that investigations with shade trees require several years to give reliable data. In general, ample moisture was found essential to the effective utilization of fertilizers and growth of the trees. Fall applications appeared more beneficial than spring applications, and so-called complete mixtures high in nitrogen appeared most effective. However, potash did not appear necessary under the conditions of the study.

A fertilization study on coniferous evergreens in the nursery, P. C. Marth and F. E. Gardner. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 653–659, figs. 2*).—Irish juniper and American pyramidal arborvitae were found to respond differently to different fertilizer treatments. It was evident that improved growth of arborvitae may be expected from applications of phosphorus and potash, as well as nitrogen, but in the Irish juniper only nitrogen and potash were beneficial under the existing conditions. The source of nitrogen was apparently of little significance, provided the material was used in proper amounts. Observing that excessive applications of nitrogen stunted the growth of evergreens, the authors suggest that some of the prejudices against the use of minerals may arise from excessive applications. Minerals in proper proportions were advantageously substituted for stable manure.

FORESTRY

[Forestry studies by the Iowa Station]. (Partly coop. U. S. D. A.). (*Iowa Sta. Rpt. 1937, pt. 1, pp. 155, 156*).—The progress of studies is reviewed on establishing and maintaining a nursery of trees, shrubs, and grasses for erosion control, by G. B. MacDonald; and volume, growth, and yield studies of Iowa timber trees, by MacDonald and R. B. Thomson.

The distribution of important forest trees of the United States, E. N. Munns (*U. S. Dept. Agr., Misc. Pub. 287 (1938), pp. 176, figs. 170*).—The information is presented graphically in the form of maps.

Natural vegetation as a factor in the losses and yields of water, J. Kittredge, Jr. (*Jour. Forestry, 35 (1937), No. 11, pp. 1011–1015*).—Stating that for average forest conditions over large areas the seasonal interception will usually run between 10 and 25 percent of the precipitation and may approach 0 percent when the vegetation has been heavily grazed, cut, or burned, the author remarks that transpiration is the most difficult factor to evaluate. Available data suggest that annual transpiration for forests ranges between 5 and 15 in., but may reach 35 in. in dense stands on the best sites. Different technics for estimating the role of vegetation in affecting water loss in forests are discussed, with suggestions as to problems which need further study.

The flow of liquid through radial resin canals, H. D. Erickson (*Jour. Forestry, 36 (1938), No. 4, pp. 417–423, figs. 2*).—Several methods of demonstrating and measuring the flow of liquids through resin canals are described. The volume of water flowing through a resin canal was measured with a fair degree of accuracy for several sections of wood. Not all the sections from

woods with resin canals showed visible evidence of flow through the canals, and the number of open canals in a given area varied not only with species but with different sections of the same wood. The noneffective canals were evidently clogged with resin or blocked by tylosoids to varying degrees or by the incomplete separation of parenchyma cells in both the sapwood and the heartwood.

The interrelations of habitat, growth rate, and associated vegetation in the aspen community of Minnesota and Wisconsin, J. Kittredge, Jr. (*Ecol. Monog., 8 (1938), No. 2, pp. 151–246, figs. 16*).—Records from 277 sample areas of the aspen community in northern Minnesota and northwestern Wisconsin, representing a region of relatively uniform climate, were analyzed in an attempt to evaluate quantitatively the interrelations between habitats, plant indicators, and the growth rates of aspen, *Populus tremuloides*. Site index, a measure of the height growth of dominant aspen, was found a better criterion of habitat productivity than was volume growth, and was said to be satisfactory for the evaluation of the differences and relative productivity of the aspen habitats. Individual plants of the aspen community did not indicate with sufficient reliability the differences either in the habitats or growth rates of aspen. The two most useful classifications for the differentiation and for the prediction of productivity were groups of plant indicators and soil-profile groups.

Seed origin affects survival of green ash in the nursery (*Jour. Forestry, 36 (1938), No. 4, p. 434*).—In the spring of 1935, 69 lots of green ash seed collected in various States of the prairie region were sown at Denbigh, N. Dak. Survival counts in 1936 showed averages of 67, 62, 48, 43, and 7 percent, respectively, for North Dakota, South Dakota, Nebraska, Kansas, and Oklahoma seed. The differences were largely due to an inability of the plants from the southern sources to survive the winter of 1935–36 despite a fair snow cover.

Effect of depth of sowing on nursery yields of black locust, H. G. Meginnis (*Jour. Forestry, 36 (1938), No. 4, pp. 411–416, fig. 1*).—At Holly Springs, Miss., observations were made on the germination of locust seed sown in late June on the surface and covered also with 0.25, 0.5, 1, and 2 in. of soil. The greatest yield of seedlings as of September 16 was secured from the 0.25-in. plats, more than twice that of the 2-in. plats. In trials in a year characterized by protracted drought, the results were inconclusive. In further trials in a favorable year, the 0.5-in. cover gave the best results, leading to the general recommendation that under conditions comparable to those of the tests black locust seed should be covered with from 0.25 to 0.5 in. of soil.

Longevity of seed and establishment of seedlings in species of Populus, E. H. Moss (*Bot. Gaz., 99 (1938), No. 3, pp. 529–542*).—Aspen seeds stored in open dishes in the laboratory usually gave 100 percent vigorous germination at the end of 4 weeks and 45 percent vigorous germination at the end of 8 weeks, after which viability was quickly lost. Balsam poplar resembled aspen in longevity of seed, while Russian poplar had somewhat longer viability under the same conditions. It is concluded that the longevity of poplar seeds under natural conditions in central Alberta is from 2 to 4 weeks, varying with the species and the season.

Planting southern pines, P. C. Wakeley (*U. S. Dept. Agr. Leaflet 159 (1938), pp. 8, figs. 2*).—This informational leaflet is a revision of and supersedes Leaflet 32 (E. S. R., 61, p. 532).

Breakage reduction in felling redwood, E. Fritz (*Jour. Forestry, 36 (1938), No. 4, pp. 405–410*).—Having ascertained that felling breakage sometimes approximates 20 percent of the net sound merchantable tree scale, the author pre-

Among helpful procedures discussed are the preparation of good layouts, felling in more than one round, and preventing the crossing of timber. With proper precautions experienced crews have reduced breakage loss to below 5 percent.

DISEASES OF PLANTS

The Plant Disease Reporter, June 15 and July 1, 1938 (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 22 (1938), Nos. 11, pp. 189–214, figs. 2; 12, pp. 215–257, figs. 2*).—The following items are included:

No. 11.—Diseases of fruit and vegetables on the New York market during January, February, March, and April 1938, by J. S. Wiant and C. O. Bratley; spinach and onion diseases in the winter garden region of Texas, by S. S. Ivanoff; early appearance of potato late blight in Long Island, N. Y., Virginia, and Tennessee; reports on potato mosaic on Long Island and leaf curl in southeastern Virginia; vegetable diseases in tidewater Virginia, by H. T. Cook; other reports on vegetable diseases, including tomato and bean diseases in Georgia and truck crop diseases reported from New York; peach leaf curl in Illinois, by G. H. Boewe; reports on apple scab from Massachusetts and New York, and other fruit diseases reported from New York; downy mildew infection of tobacco plants in the field in Virginia and North Carolina; tobacco diseases in Massachusetts, by O. C. Boyd; tobacco plant bed diseases in Florida, 1938, by W. B. Tisdale and R. R. Kincaid; cereal diseases in Oklahoma, by K. S. Chester; the weather and cereal diseases in Iowa, by H. C. Murphy; fungi (annotated list) found on chestnut and chinquapin in Oregon, Washington, and British Columbia, by J. L. Bedwell and M. E. Fowler; diseases of ornamental shrubs in Oregon, by J. A. Milbrath; and brief notes on bacterial wilt of sweet corn in New York, bacterial wilt on dent corn in Virginia, leaf blister of oak in Georgia, sycamore anthracnose in Nebraska, and Dutch elm disease eradication.

No. 12.—Additions to the list of plants attacked by the root knot nematode (*Heterodera marioni*) (477 additions to the list previously noted (E. S. R., 69, p. 681)), compiled by E. M. Buhrer; relative prevalence and geographical distribution of various ear rot fungi in the 1937 corn crop, by P. E. Hoppe; bacterial wilt on sweet corn in New York; *Septoria nodorum* on nodes of wheat in Kansas, by D. B. Creager; reports on rusts and other diseases of small grains in Texas, Kansas, and California; cotton diseases reported from Texas, by C. H. Rogers; tobacco diseases in Canada in 1937, by G. H. Berkeley; tobacco seedbed survey in Wisconsin, 1938, by J. Johnson; reports on downy mildew of tobacco (*Peronospora tabacina*) in Massachusetts and Virginia; *Alternaria* rot of potato tubers, downy mildew in onion fields, and rust on wild onions in New York; *Verticillium alboatrum* wilt of woody plants in Illinois (with annotated host list), by J. C. Carter; additional notes on the distribution of witches'-broom of black locust, by T. J. Grant; and brief notes on rust on rust-resistant snapdragons in Louisiana, plum pockets in Massachusetts, X-disease in a peach orchard in New York, and southern sclerotial rot on sugar beet in Arizona.

Plant pathology (*Arizona Station Rpt. 1937, pp. 77–89, 90, figs. 8*).—Progress reports are included on control of date fruit rot; angular leaf spot of cotton, with special reference to delinting of seed by H_2SO_4; *Graphiola* leaf spot of date and other palms; *Phymatotrichum* root rot (E. S. R., 78, p. 796); bacterial slime of lettuce; and miscellaneous studies, including peach mosaic, curly top virus, root knot, the stem and bulb nematode, *Pythium* on cucurbits, sclerotiniose of lettuce, assistance to seed potato growers, cotton wilt, rhizome rot of iris associated with a *Fusarium*, and *Sclerotium rolfsii*.

[Plant disease work by the Florida Station] (*Florida Sta. Rpt. 1937, pp. 65, 66, 71, 93–96, 97–103, 104–112, 122–126, 130, 132–135, 152–156, 160, 161, 172, 173, 177, 178, figs. 2*).—Progress reports are given on "chlorosis" in corn plants, by R. M. Barnette; bronzing or copper leaf of citrus, by C. E. Bell and R. W. Ruprecht; root knot investigations on various crop and ornamental plants, by J. R. Watson, C. C. Goff, and H. E. Bratley; disease control in potatoes, and brown rot (*Bacterium* [=*Phytomonas*] *solanacearum*) of potatoes and its control, both by A. H. Eddins; a comparative study of forms of *Diplodia* resembling *D. frumenti* from corn, by R. K. Voorhees; *Fusarium niveum* wilt, and other fungus diseases of watermelons and their control, both by M. N. Walker; so-called rust of *Asparagus plumosus*, by W. B. Shippy; control of *F. lycopersici* wilt of tomatoes in Florida, by G. F. Weber and D. G. A. Kelbert; *Clitocybe* mushroom root rot of citrus and other woody plants in Florida, by A. S. Rhoads; factors affecting decay in citrus fruits, by W. B. Tisdale and Voorhees; a bark disease of Tahiti lime trees associated with fungi, particularly *Phomopsis citri*, by Tisdale; rose diseases in Florida and their control, by Shippy; fruit rots of grapes, by K. W. Loucks; mosaic diseases of pepper, tomato, pokeweed, and *Crotalaria*, all by A. N. Brooks; host relations and factors influencing the growth and parasitism of *Sclerotium rolfsii*, by E. West; a hitherto unreported disease of beans in Florida due to an aerial species of *Rhizoctonia*, by Weber; seed and soil treatments for controlling seed- and soil-borne plant diseases, by S. O. Hawkins; a comparative study of the pathogenicity and taxonomy of species of *Alternaria*, *Macrosporium*, and *Stemphylium*, by Weber; gummosis and psorosis of citrus trees, by Rhoads; celery spraying tests, by Tisdale and E. R. Purvis; pink rot of celery, by Brooks; and downy mildew-resistant cantaloups and cucumbers, and two fungus diseases (cabbage yellows due to *F. conglutinans*, and tomato wilt due to *Verticillium alboatrum*) new to Florida, all by Weber. Similar reports from the Citrus Substation include work on dieback of citrus, by B. R. Fudge; melanose and stem-end rots of citrus fruits, by W. A. Kuntz; and the effect of zinc and other unusual mineral supplements on the growth of horticultural crops, with special reference to zinc deficiency in citrus, by A. F. Camp and W. Reuther. From the Everglades Substation progress reports are given on work with seed- and soil-borne diseases of vegetable crops (including potato seed-piece decay by *Fusarium* sp. and bacteria, seed decay and seedling blight of lima beans due to *Fusarium* sp. and *Rhizoctonia* sp., seed and seedling rot of peas due to *Rhizoctonia* sp., black rot of cabbage, damping-off in celery seedbeds due to *Rhizoctonia* sp., blight of peppers due to *Phytomonas vesicatora* [=*Bacterium vesicatorum*], and bean seed treatments), and leaf blights of vegetable crops (including bean rust due to *Uromyces phaseoli typica*, early blight of celery, and spraying and dusting of tomatoes and lima beans), all by G. R. Townsend. Similar reports from the North Florida Substation include field and laboratory studies of tobacco diseases, and the development of strains of cigar-wrapper tobacco resistant to black shank, both by L. O. Gratz and R. R. Kincaid; and from the Subtropical Substation on studies of diseases of minor fruits and ornamentals, control of potato diseases in Dade County, a study of diseases of avocados and mangoes and the development of control measures, and the control of tomato diseases by spraying, all by G. D. Ruehle.

[Report on] plant pathology [*Hawaii Sta. Rpt. 1937, pp. 35–38, 39–42, 43–45*).—Progress reports are given on studies of taro diseases, including soft rot (*Pythium*) and vascular necrosis (cause unknown) of the corm, and leaf pathogens, all by G. K. Parris; *Actinomyces scabies* and *Rhizoctonia solani* on potatoes

by Parris and **K. Kikuta**; the effects of virus diseases on potato yields, and tomato diseases, including a new virus disease for Hawaii, and *Heterodera marioni*, all by Parris; and a list of miscellaneous fungus diseases and insect pests of plants encountered during the year.

[Plant disease work by the Iowa Station]. (Partly coop. U. S. D. A.). (*Iowa Sta. Rpt. 1937, pts. 1, pp. 108–116, 119, 120, 122, 123, 125–127, 128, 155, figs. 2; 2, pp. 30, 31, 36–38, 44–47, 51–58, fig. 1*).—Progress reports are included in part 1 on the breeding and selection of better resistant strains of watermelons, by S. G. Younkin, I. E. Melhus, and D. V. Layton; parasitism of smuts, rusts, and minor diseases of oats, by H. C. Murphy; development of disease-resistant strains of oats, by Murphy and L. C. Burnett; control of seed- and soil-borne diseases of potatoes, by C. S. Reddy; pathogenicity, host response, and control of *Cercospora beticola* leaf spot of sugar beets, by C. M. Nagel; development and testing of dust fungicides for control of seed-borne diseases of wheat and oats, by Reddy; propagation of disease-free sweetpotato seed stock, by Melhus; seedling structure of wilt-resistant watermelons and the inheritance of fruit shape and flesh color, by J. N. Martin and A. E. Braun; yellow dwarf and other onion diseases in Iowa, by G. N. Davis and Melhus; control of gladiolus diseases in Iowa, by Reddy; apple scab, by Melhus; plant pathology phases of barley breeding, especially for scab resistance, by Reddy; influence of pythiaceous and other fungi on seedling stands of legumes and other crops, by Melhus, Reddy, and W. F. Buchholtz; identification and control of diseases of small ornamentals and fruit tree stocks in Iowa nurseries, including the use of *Pseudomonas tumefaciens* (=*Phytomonas tumefaciens*) bacteriophage as a control agent for crown gall in nurseries, by Melhus; diseases causing poor stands of flax in Iowa, by Reddy; and white pine blister rust control in Iowa, by G. B. MacDonald, C. J. Drake, and Melhus.

In part 2 progress reports are given on the development of laboratory technics for detection of seed-borne plant pathogens, by G. N. Davis and R. H. Porter; developing inbred lines of corn resistant to stalk and ear rots, by R. W. Jugenheimer and A. A. Bryan; genetic investigations of bacterial wilt resistance in corn, by E. W. Lindstrom; physiological response of the growing plant and the pathogen to chemical treatments of seed corn, by C. S. Reddy; effect of organic mercury dusts on seeds of corn, oats, barley, and flax, by Porter; fermentation products formed by the action of certain fungi on the byproducts of the corn plant, by J. C. Gilman, W. E. Loomis, and C. H. Werkman; factors influencing resistance of strains of corn to *Ustilago zeae*, by I. E. Melhus and Davis; *Diplodia zeae* dry rot of corn, by Melhus; a study of the pathogenicity of *Basisporium gallarum* to corn, by Reddy; measuring and combining disease resistance in corn, by Reddy, J. H. Standen, and Melhus; and a plant disease survey of the State, by Melhus, Reddy, Porter, and Davis.

[Plant disease work by the Kentucky Station] (*Kentucky Sta. Rpt. 1937, pt. 1, pp. 7–10, 42, 43, 47, 48*).—Brief progress reports are included on the following tobacco diseases: Leaf spot and wildfire, blue mold, mosaic control under farm conditions, a new plant-bed disease probably associated with excess soil moisture and from which a fungus was consistently isolated, blackleg (*Bacillus aroideae*=*Erwinia aroidea*), brown root rot, and black root rot- and mosaic-resistant tobaccos. Thallium toxicity and frenching of tobacco, the function of boron in plant metabolism as shown by sand cultures of sweetpotatoes with different amounts of this element, and characteristic symptoms developing with excesses or deficiencies, and the virus-induced phony peach disease are also included.

List of causes of fungous and bacterial plant diseases in Maine to 1936 inclusive, M. T. HILBORN and F. L. MARKIN. (Maine Expt. Sta.). (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 1938, Sup. 105, pp. 60, fig. 1*).—This list was compiled "(1) to record every known fungus and bacterial disease of green plants and their parts as grown in Maine, excluding those imported for sale only, and (2) to indicate the geographic distribution, prevalence, and possible economic importance of such diseases." The hosts are listed alphabetically by Latin names, and under each is an annotated list of its observed parasites. An index to the latter is also provided.

[Plant disease work by the Massachusetts Station]. (Partly coop. U. S. D. A.). (*Massachusetts Sta. Bul. 347 (1938), pp. 20–22, 30–37, 41, 45–47*).—Progress reports are given on cooperative tobacco investigations, including black root rot, and reductions in yield and quality due to mosaic, both by C. V. Kightlinger; diseases of ornamental herbaceous plants due to soil-infesting organisms, with particular reference to control, and damping-off and growth of seedlings and cuttings of woody plants as affected by soil treatments and environal modifications, both by W. L. Doran; chemical soil-surface treatments in hotbeds for damping-off control in early forcing vegetables, by Doran and E. F. Guba; tomato resistance to *Cladosporium* leafmold, and carnation blight due to *Alternaria dianthi*, both by Guba; causes and control of winter squash decay in storage, and miscellaneous tests and experiments (begonia leaf nematode control, apple scab control, vegetable seed treatments, cucumber resistance to powdery mildew, and copper spray tests on cucumbers, muskmelons, and tomatoes), all by Guba and C. J. Gilgut; tree diseases in the State, by M. A. McKenkie and A. V. Osmun; *Cytospora* disease of spruce, by Gilgut; physical and chemical properties of mosaic viruses, by M. E. Freeman; and cooperative cranberry investigations, including the development of strains resistant to false blossom, the oxygen content of flooding water in relation to the vines, and spraying experiments, all by H. F. Bergman and W. E. Truran, and blueberry disease investigations, by Bergman.

[Plant disease work by the New Hampshire Station] (*New Hampshire Sta. Bul. 304 (1938), pp. 29, 30, 31*).—Reports of progress are included on weathering and lime-sulfur injury and deterioration of leaf-roll potatoes, both by O. Butler, and on spraying for apple scab, by S. Dunn and Butler.

[Plant disease work by the Rhode Island Station] (*Rhode Island Sta. Rpt. [1937], pp. 24, 25, 26, 27–32*).—Brief reports of progress are included on spray injury to tomatoes; soil sterilization with chloropicrin in greenhouses and for field and vegetable crops and turf; life history, epidemiology, and control of *Botrytis elliptica* infection in *Lilium formosanum;* laboratory studies on the toxicity of fungicides to *Sclerotinia fructicola* conidia; development of *S. fructicola* apothecia; development and discharge of *Venturia inaequalis* ascospores in relation to apple bud development and Rhode Island weather—1937; control of *Phomopsis* blight of juniper; heartwood rot following winter injury on plums associated with *Polystictus versicolor* and *Panus stypticus;* early and late blights of potatoes; control of early blight (*Alternaria solani*) of tomatoes; and turf disease control.

Minutes of the section of biology (*Va. Acad. Sci. Proc., 1937, pp. 40, 41, 42, 43*).—Abstracts of the following papers of interest to plant pathology are included: Importance of Graphite Lubricant for Treated Cabbage Seeds, by H. T. Cook (Va. Truck Expt. Sta.); and Infection of *Buxus sempervirens* by *Verticillium* sp., by J. G. Harrar (Va.).

New trends and old traditions in plant pathology, J. B. S. NORTON. (Md Expt. Sta.). (*Peninsula Hort. Soc. [Del.] Trans., 51 (1937), pp. 63, 64*).

Distinctive plant symptoms caused by deficiency of any one of the chemical elements essential for normal development, J. E. McMurtrey, Jr. (*Bot. Rev., 4 (1938), No. 4, pp. 183–203, pl. 1*).—In this critical review, the author has attempted to cite those references (131) believed to "have contributed something to our knowledge concerning distinctive symptoms on plants due to a deficiency of any one of the chemical elements essential for growth and development of green plants, including boron, calcium, copper, iron, manganese, magnesium, nitrogen, phosphorus, potassium, sulfur, and zinc." A key to deficiency effects of the elements listed on tobacco plants grown in solution cultures is included.

Pathology of the plant cell.—II, Pathology of plastids, E. Küster (*Pathologie der Pflanzenzelle. Teil II, Pathologie der Plastiden. Berlin: Borntraeger Bros., 1937, pt. 2, pp. XI+152, figs. 91*).—Continuing this monograph series (E. S. R., 66, p. 832), the text is presented under the main headings of changes in form, structure, and color. The literature references cover 12½ pages, and subject and author references are provided.

The biophysics and biochemistry of viruses, W. M. Stanley (*Jour. Appl. Phys., 9 (1938), No. 3, pp. 148–155, figs. 2*).—This is a critical review (with 34 literature references) of the history and present status of the subject for both plant and animal viruses.

Stream double refraction of virus proteins, M. A. Lauffer and W. M. Stanley (*Jour. Biol. Chem., 123 (1938), No. 2, pp. 507–525, figs. 7*).—Using a micromethod (described) for quantitative comparison of the double refraction of flow of different materials, purified proteins isolated from tobacco plants infected with tobacco mosaic, aucuba mosaic of tomato, severe etch, tobacco ring spot, latent mosaic of potato, Holmes' masked tobacco mosaic, and a mild tobacco mosaic all showed this phenomenon, while the elementary bodies of vaccinia and the Shope papilloma virus protein did not. *Limulus* and *Helix* hemocyanin and hog thyroglobulin showed a small amount of double refraction of flow in concentrated solutions. This phenomenon in tobacco mosaic virus protein solutions appeared to be due to the orientation of rods rather than to the photoelastic effect, since there was no direct relationship with changes in viscosity. Furthermore, a time lag in the disappearance of double refraction occurred after cessation of streaming. Double refraction was also found to persist after a stream of virus solution was allowed to pass from a pipette into the air, thus indicating that the phenomenon is not directly dependent on the shear and hence is not due to the photoelastic effect. On standing, relatively concentrated solutions of tobacco mosaic virus protein separated into two layers, the bottom one being doubly refracting.

Sporophore formation by Fomes applanatus in culture, H. Hopp (*Phytopathology, 28 (1938), No. 5, pp. 356–358, fig. 1*).—Mycelium growing on 60 small wood blocks of *Populus canadensis eugenie* was subjected to controlled conditions of humidity and aeration. Fertile sporophores formed in aerated culture, and they were typical under aeration at 75 percent relative humidity.

Laboratory comparisons of copper fungicides, S. E. A. McCallan and F. Wilcoxon (*Contrib. Boyce Thompson Inst., 9 (1938), No. 3, pp. 249–263, figs. 4*).—Bordeaux mixture and nine other representative copper compounds were compared with respect to toxicity, adherence, and foliage injury, the evaluations being based on equal copper concentrations. The details are given for a method of calculating the LD 50 (concentration permitting 50 percent spore germination) and its standard deviation from the toxicity curves of laboratory tested compounds. The toxicity determinations both before and after exposure to laboratory "rain" with spores of *Sclerotinia fructicola*, *Botrytis paeoniae*,

Glomerella cingulata, *Alternaria solani*, *Uromyces caryophyllinus*, and *Gymnoconia peckiana* demonstrated the marked superiority of bordeaux over all other preparations tested. Copper phosphate and basic copper sulfate proved very inferior in toxicity, while Oxo Bordeaux, Coposil, copper oxychloride, Cuprocide, Copper Hydro "40," copper oxalate, and copper zeolite were intermediate. Of the latter class, Oxo Bordeaux and Coposil are probably the most toxic and copper zeolite the least so.

Adherence tests based on chemical analyses and toxicity before and after laboratory rain showed bordeaux mixture, Cuprocide, and copper oxychloride to be the most adherent, and copper oxalate and basic copper sulfate the least so. Limited greenhouse tests on lettuce, buckwheat, corn, and bush bean, and outdoor tests on peach and apple indicated that, in general, those compounds most toxic to fungus spores are also most toxic to the leaves, but the difference in phytocidal properties was not as great as that of the fungicidal properties, and all the compounds injured to some extent in the outdoor tests. Compounds equal to or exceeding bordeaux in injury were Coposil, Cuprocide, copper oxychloride, Oxo Bordeaux, and basic copper sulfate, while those producing less injury were copper zeolite, Copper-Hydro "40", copper phosphate, and copper oxalate.

A combination of high fungicidal with low phytocidal properties apparently has not yet been attained in copper preparations, but bordeaux mixture has at least as great a range in this respect as any other copper compound. In special cases (e. g., lime sensitiveness) certain of these compounds may be more desirable than bordeaux. It is indicated that after 50 yr. of experimentation with copper compounds none equal to bordeaux mixture has yet been found.

The weathering of bordeaux mixture, F. Wilcoxon and S. E. A. McCallan (*Contrib. Boyce Thompson Inst., 9 (1938), No. 3, pp. 149–159, figs. 6*).—When 225 cm^2 glass plates sprayed with 4–4–50 bordeaux mixture were exposed outdoors, changes in the composition of the film were accompanied by an increase in soluble copper, the highest amount observed being 0.45 mg per plate when agitated with 50 cc of water. Carbonation of the excess lime was complete in a few hours, but the increases in soluble copper occurred much later. The results were duplicated in the laboratory only if a sprayed, dried film was used. Washing in bulk by centrifuging or on a Buchner funnel did not lead to substantial increases in soluble copper. When bordeaux mixtures low in lime were subjected to rain, soluble copper appeared sooner. Treatment of the films with CO_2 led to but little increase in soluble copper. It is believed that the increases observed can best be explained by assuming that the weathered bordeaux precipitate is an adsorption complex, or a solid solution containing copper, lime, and sulfate, the copper of which is soluble in water to an extent varying with its composition. The presence of small amounts of soluble copper must be considered in connection with foliage injury, as well as in fungicidal action where it may supplement the solvent action of spore excretions previously reported (E. S. R., 77, p. 495).

A new pathogenically distinct race derived from a cross between *Tilletia tritici* and *T. levis*, C. S. Holton. (U. S. D. A. and Wash. and Idaho Expt. Stas.). (*Phytopathology, 28 (1938), No. 5, pp. 371, 372*).—An F_3 segregate with certain pathogenic properties of both parents was derived from a hybrid between physiological races 9 of *T. tritici* and 8 of *T. levis*. Race L_8 is distinguishable by the susceptibility of Oro and resistance of Hohenheimer, and T_9 by the reverse reactions. The hybrid fungus, distinguishable from both parents by the susceptibility of both Oro and Hohenheimer, was made by inoculating seedlings of the Hard Federation variety with a combination of two sexually compatible

Pathological problems in the breeding of disease-resistant wheat and barley varieties in the summer wheat region of the United States [trans. title], E. C. STAKMAN, J. J. CHRISTENSEN, and H. BECKER. (Univ. Minn. and U. S. D. A.). (*Züchter, 10 (1938), No. 3, pp. 57–68, figs. 2*).

Influence of environment, after seedling emergence, on covered smut in barley, V. F. TAPKE (*Phytopathology, 28 (1938), No. 5, pp. 370, 371*).—Experimental evidence is presented in support of the hypothesis that if the fungus (*Ustilago hordei*) has not become well established within the host tissues before seedling emergence, then relatively low temperatures and other outdoor factors immediately thereafter may play a highly important role in decreasing the incidence of this disease.

Notes on the hot-water treatment of Anguina tritici galls on wheat and a comparison of an Indian and a Chinese collection by use of weight criteria, D. P. LIMBER (*Helminthol. Soc. Wash. Proc., 5 (1938), No. 1, pp. 20–23, fig. 1*).—No control was indicated for hot-water treatments less severe than 122° F. for 30 min. following 2 hr. of presoaking.

Counts of the nematode content of galls from Ladak, India, weighing 2.5–9.2 mg gave populations of 3,566–23,700 second-stage larvae. Similar counts of galls from Nanking, China, weighing 3.3–9.2 mg gave populations of 5,425–29,200 second-stage larvae. The Indian galls averaged 2,110 larvae per milligram gross gall weight, and the Chinese galls 2,829. The data given indicate that the Chinese galls had lighter walls, and also that the larvae weighed less than those from the Indian material.

Studies on foot and root rot of wheat.—V, The relation of phosphorus, potassium, nitrogen, and calcium nutrition to the foot- and root-rot disease of wheat caused by Helminthosporium sativum P. K. & B., W. C. BROADFOOT and L. E. TYNER (*Canad. Jour. Res., 16 (1938), No. 3, Sect. C, pp. 125–134, pl. 1, fig. 1*).—In continuation of this series (E. S. R., 71, p. 493), the effects of different amounts of phosphorus, potassium, nitrogen, and calcium on the development of foot rot were studied in the greenhouse, the seed being planted in sterilized pure quartz sand to which the necessary nutrients and spore suspension were added and aseptic conditions being maintained for the first ten days. In the seedling stage of wheat, the disease was found to increase when the ionic concentration of potassium, nitrogen, and calcium was decreased below that of the complete nutrient solution, but no significant disease reduction was noted when the concentrations of all the elements, including phosphorus, were increased moderately above those in the complete nutrient solution. Apparently extremely small concentrations of phosphorus had no effect on the disease, but decreasing the other three elements below the optimum amounts seemed to predispose the seedling to more severe damage by the disease.

Susceptibility of alfalfa varieties to bacterial stem blight, B. L. RICHARDS. (Utah Expt. Sta.). (*Utah Acad. Sci., Arts, and Letters, Proc., 14 (1936–37), pp. 33–38, figs. 2*).—In these tests, 53 varieties grown under natural conditions (1933, 1935) in the field exhibited a wide range of susceptibility, Ladak alfalfa showing the least. The results indicate that even under very favorable disease conditions this variety would not be greatly injured in Utah, but that this would not be true for any of the others. The severity of stem blight as tested in Salt Lake County suggests the necessity of combining resistance to this disease with that for wilt in any variety developed for Utah conditions. No correlation was found in the resistance to these two bacterial diseases. Individual plants in all varieties tested remained free from stem blight, suggesting the possibility of finding blight-resistant strains. Its severity in both seasons was definitely correlated with frost injury.

White clover as a host of the sugar-beet nematode, C. W. McBeth (*Helminthol. Soc. Wash. Proc., 5 (1938), No. 1, pp. 27, 28, fig. 1*).—An establishment of *Heterodera schachtii* on *Trifolium repens* associated with lawngrass at Salt Lake City, Utah, is here reported. The injury resembled root knot in that gall-like swellings were present.

Strand formation in Phymatotrichum omnivorum, C. H. Rogers and G. M. Watkins. (Texas Expt. Sta.). (*Amer. Jour. Bot., 25 (1938), No. 4, pp. 244–246, figs. 11*).—This study indicates a similar strand formation on infected cotton roots, in pure cultures of the fungus, and among hyphae developing from sclerotia. The mycelium is composed of large hyphae with numerous repeatedly ramifying lateral hyphae of progressively smaller diameter. Some of the smaller hyphae contact the larger ones at irregular intervals and begin to grow over their surfaces, the process continuing until the central hypha in each case is covered with a more or less compact pseudoparenchyma. Subsequent cell layers are deposited in the same way on the strand.

Some recent developments in the control of potato diseases, W. H. Martin. (N. J. Expt. Stas.). (*Veg. Growers Assoc. Amer. Ann. Rpt., 1937, pp. 190–205*).—This is a review (with 23 literature references) dealing chiefly with improved seed potatoes, potato scab and *Rhizoctonia* control, fungicidal sprays, and resistant varieties.

Further observations on "blue stem" of potato, C. R. Orton and L. M. Hill. (W. Va. Expt. Sta.). (*Amer. Potato Jour., 15 (1938), No. 3, pp. 72–77, figs. 2*).—Continuing these studies (E. S. R., 78, p. 62), this paper compares symptoms which might be confused with other diseases and reports further progress. The most outstanding feature of blue stem is that the necrosis extends to the pith and cortex of the tubers as well as to the vascular ring. The evidence to date indicates that the disease apparently does not occur in serious proportions outside of Pennsylvania, western Maryland, and West Virginia, that bacteria or fungi almost certainly are not involved, that transmission does not occur through the tubers, and that some insect is probably associated.

The measurement and inheritance of scab resistance in selfed and hybrid progenies of potatoes, J. G. Leach, F. A. Krantz, P. Decker, and H. Mattson. (Minn. Expt. Sta.). (*Jour. Agr. Res. [U. S.], 56 (1938), No. 11, pp. 843–853, fig. 1*).—The relative resistance to *Actinomyces scabies* of 60 seedling families was studied, a mean scab rating for each being determined and expressed by a numerical scale which measured resistance both on the type of lesion and the amount of surface area affected. Use of all the available data for statistical analyses became possible through the single numerical rating. Four methods of measurement were compared, three of which proved very satisfactory. Direct comparisons revealed significant differences in scab resistance and indicated the relative breeding value of parent varieties or selections. A significant difference between the mean scab rating of 10 selfed lines was associated with a similar but smaller difference in the averages of their hybrid families. Grouped according to the reaction of both parents, crosses between susceptibles gave a significantly higher mean scab rating than susceptible × resistant parents. The latter had a significantly higher mean scab rating than crosses between intermediates or intermediate × resistant parents. The crosses between resistant parents gave a significantly lower mean scab rating than any of the other four types.

Effects of bordeaux mixture on the control of yellow dwarf of potatoes, E. O. Mader and T. C. Watkins. (Cornell Univ.). (*Phytopathology, 28 (1938), No. 5, p. 375*).—In these tests, bordeaux applications to potato foliage resulted in

a significant reduction of yellow dwarf plants from 3.3 to 0.3 percent. Population counts showed no significant reduction in the number of clover leafhoppers (*Aceratagallia sanguinolenta*) in the sprayed and unsprayed plats. It is suggested that copper taken up by the sprayed plants during or after spraying may render the virus partially or totally noninfectious.

The Cobbler seed supply of the United States, C. L. FITCH. (Iowa Expt. Sta.). (*Amer. Potato Jour., 15 (1938), No. 4, pp. 91–98, fig. 1*).—Tuber-borne plant diseases, particularly virus diseases, *Fusarium* and *Verticillium* wilts, and *Phytophthora* blight, are shown to be a most important factor in reducing seed potato yields of the Cobbler variety in the United States. A review of potato seed certification in 1937 indicated that in most States producing Cobbler seed few fields were free from virus. A higher proportion were free in the provinces of eastern Canada.

The longevity of Cercospora beticola in soil, C. M. NAGEL. (Iowa Expt. Sta.). (*Phytopathology, 28 (1938), No. 5, pp. 342–350*).—This article indicates that *C. beticola* is not only able to live in the soil, but that it spreads to the cotyledons and leaves of sugar beets. The fungus grew well in at least five soil types. After 18 and 27 mo. it remained viable and pathogenic in sterile soil cultures. After 9 and 20 mo. in spontaneously infected field soil, though still viable, there was a marked decline in the amount of the fungus present at 20 mo., as determined by the amount of initial infection. In young soil cultures conidia were always produced abundantly. Without losing either viability or pathogenicity, the fungus tolerated temperatures of +15.5° to −27.8° C. For the soils tested, there appeared to be no relation between pH and amount of mycelial development at pH 6.0–7.4, but there was more rapid mycelial growth on soils rich in organic matter. In beets grown on a field severely infected the preceding season, leaf spot was very destructive and the yield and percentage of sucrose were notably depressed, while relatively low infection with higher yield and sucrose content occurred on adjacent land not in beets for several preceding seasons.

A method is described for isolation of the fungus from the soil indirectly by means of the host plant.

Cane diseases in Hawaii, J. P. MARTIN and C. W. CARPENTER (*Hawaii, Sugar Planters' Assoc. Proc., 57 (1937), Expt. Sta. Com. Rpt., pp. 30–34*).—Progress reports are included in work with chlorosis, elemental injuries (leaf burn), eye spot disease, leaf diseases, leaf scald, growth failure and *Pythium* root rot, physiological disorders, and growth failure problems.

Sweet potato sprout treatments for the control of wilt disease, T. F. MANNS and J. W. HEUBERGER. (Del. Expt. Sta.). (*Peninsula Hort. Soc. [Del.] Trans., 51 (1937), pp. 127–130*).—Two years' tests of sweetpotato sprout treatment with copper and mercury compounds are reported to have shown increased stands through control of *Fusarium* wilt. In 1936 the untreated sprouts averaged 64 percent wilt as against 4–5 percent for several of the treatments. The corresponding figures for 1937 were 31 and 3–7 percent. It was indicated that it may be possible to use several of the insoluble copper materials as root dips. These compounds cost much less than the organic mercury preparations, are less toxic to the plants, and do not retard early growth as strongly as do the mercurials.

The influence of four mosaic diseases on the plastid pigments and chlorophyllase in tobacco leaves, P. D. PETERSON and H. H. MCKINNEY (*Phytopathology, 28 (1938), No. 5, pp. 329–342*).—A yellow and three green mosaics are compared on several plant species grown over a range of temperatures. The pigment and chlorophyllase determinations were made on tobacco

grown in a greenhouse at ±24° C. in the winter. During the summer the temperature fluctuated with the weather. All of the viruses caused a reduction in the amounts of chlorophyll, carotene, and xanthophyll, the greatest reductions being associated with the yellow mosaic. On the other hand (except for common mosaic) the chlorophyllase activity rose in the diseased plants, the greatest increase occurring in plants with yellow mosaic. In direct contrast, when mosaic-free tobacco leaves became yellow from malnutrition or senility, the chlorophyllase activity decreased. Comparing leaf, stem, and root tissues in yellow mosaic plants, the chlorophyllase activity was proportional to the chlorophyll content, being very low in pith and root tissues.

Inheritance of resistance to tobacco-mosaic disease in Browallia, F. O. HOLMES (*Phytopathology, 28 (1938), No. 5, pp. 363–369, figs. 2*).—Morphologically identical plants of *B. speciosa major* fell into two categories with respect to type of infection with tobacco mosaic virus, some allowing systemic spread of the virus but others effectively localizing it. Systemic spread at first caused chlorosis of the young leaves and reduction of the growth rate, later inducing mottling and distortion of both leaves and flowers. In plants of the second class, localization of the virus in or near necrotic primary lesions was followed by abscission of all infected leaves. The necrotic-type plants possessed a dominant gene *N* in homozygous (*NN*) or heterozygous (*Nn*) condition. This gene was responsible for the necrotic type of reaction, and was not found in the chlorotic-type plants (*nn*). The homozygous, necrotic-type plants constitute a subvariety capable of recovering promptly from infection with tobacco mosaic virus, even when repeatedly inoculated.

Disease resistance in horticultural crops, C. E. TEMPLE. (Univ. Md.). (*Peninsula Hort. Soc. [Del.] Trans., 51 (1937), pp. 150–158*).—This article briefly summarizes the history of disease control by resistant plant hybrids or selections, including discussions of outstanding examples.

Vegetable diseases in 1936, G. P. CLINTON. (Conn. [New Haven] Expt. Sta.). (*Conn. Veg. Growers' Assoc. Rpt., 1936, pp. 51–54*).—Seasonal data on vegetable diseases are briefly summarized, and a progress report is presented on studies of late blight of potatoes and tomatoes with special reference to overwintering other than in infected tubers. As a result of the author's studies as a whole, it is believed that the disease depends very largely or almost entirely on the infection of potatoes for its appearance in tomato fields.

Vegetable diseases in 1937 and improvements in methods of control, A. A. DUNLAP. (Conn. [New Haven] Expt. Sta.). (*Conn. Veg. Growers' Assoc. Rpt., 1937, pp. 38–40*).—Local seasonal notes are presented on diseases of sweet corn, peas, onions, peppers, cabbages, tomatoes, muskmelons, potatoes, and sweetpotatoes, and on their control.

Investigations in the control of vegetable diseases in Ohio, J. D. WILSON. (Ohio Expt. Sta.). (*Mich. Muck Farmers Assoc. Proc., 18 (1936), pp. 23–26*).—This sets forth the recommended disease control programs for various truck crops as based on recent investigations.

Spraying and dusting celery for blight, J. E. HOWITT (*Canad. Hort. and Home Mag., 61 (1938), No. 4, Fruit Ed., p. 114, fig. 1*).—The fungus-induced early and late blights of celery are reported to have been effectively controlled by copper-lime dust or by bordeaux spray in a season favorable to disease. Treatments both in the seedbed and in the field are necessary to success.

A soft-rot bacteriosis of pumpkin fruits, P. A. ARK and C. M. TOMPKINS. (Univ. Calif.). (*Phytopathology, 28 (1938), No. 5, pp. 350–355, figs. 4*).—The bacterial soft rot organism of pumpkin in California, identified as *Erwinia aroideae* (=*Bacillus aroideae*), is said to attack a large number of varieties of

squash, gourd, pumpkin, celery, and also other plants under natural conditions. Several resistant varieties of pumpkin and celery are reported.

Apple scab control in 1937, J. M. Hamilton and D. H. Palmiter. (N. Y. State Expt. Sta.). (*N. Y. State Hort. Soc. Proc., 83 (1938), pp. 22–29*).—Seasonal field notes are contributed.

Spraying recommendations for control of apple scab, W. H. Martin. (N. J. Expt. Stas.). (*N. J. State Hort. Soc. News, 19 (1938), No. 3, pp. 1009, 1012, fig. 1*).—This address outlines local schedules based on work by the stations.

Use of boron for control of internal cork, drouth spot, and related diseases of apples, A. B. Burrell. (Cornell Univ.). (*N. Y. State Hort. Soc. Proc., 83 (1938), pp. 200–202*).—Based on experimental tests, borax broadcast by hand about the time of the delayed dormant or prepink spray on an area extending 2 ft. beyond the branches is recommended.

New spray combinations and new spray materials used on apples in 1937, T. F. Manns, J. F. Adams, and J. W. Heuberger. (Univ. Del.). (*Peninsula Hort. Soc. [Del.] Trans., 51 (1937), pp. 51–54*).—According to this brief summary and tabulation of the season's results, lime-sulfurs in combination with wettable sulfurs controlled scab about as well as the copper sprays and with much less russeting. For fruit spot, bitter rot, and black rot there was very little difference in control as between the lime-sulfur combinations and the copper and sulfur combinations. The greatest value of the wettable sulfurs in these combinations was in the production of fruit with a finer finish. None of the copper compounds alone or in combination proved safe until after petal fall, and in some varieties it was preferable to delay such sprays until after the second cover spray.

The seriousness of spray injury, W. C. Dutton (*Peninsula Hort. Soc. [Del.] Trans., 51 (1937), pp. 46–50*).—The apple spray injuries discussed are believed to have been due to (1) definite lime-sulfur injury, (2) the physiological effect of lime-sulfur, and (3) arsenical injury. Lime-sulfur burn reduced the leaf areas and in some cases probably predisposed the leaves to arsenical injury. The arsenical injury caused severe leaf fall, especially when used with lime-sulfur, and the latter undoubtedly lowered the efficiency of the leaves remaining. If lowered functioning or loss of leaves occurs, the size, color, and quality of the fruit may be affected, the set may be reduced, and blossom bud formation may be restricted. Procedures giving adequate control with a minimum of injury must be adapted to each set of orchard conditions.

Controlling cherry leaf spot, J. M. Hamilton. (N. Y. State Expt. Sta.). (*N. Y. State Hort. Soc. Proc., 83 (1938), pp. 216–223*).—This article reports the first season's results in the testing of the newer wettable sulfur sprays. Some of these gave great promise as bordeaux substitutes for control of cherry leaf spot.

Insoluble copper sprays for the control of cherry leaf spot and other fruit diseases, H. F. Winter. (Ohio Expt. Sta.). (*Ohio State Hort. Soc. Proc., 71 (1938), pp. 136, 138, 140*).—The insoluble copper compounds are reported to have proved unsatisfactory for apples and peaches under Ohio conditions, but Cupro-K, basic copper chloride, and Coposil, tested in 1937, gave excellent control of leaf spot on sour cherries under conditions favorable both to copper injury and to the disease.

Some problems in the dissemination of bacterial spot of peach, T. F. Manns and J. W. Heuberger. (Del. Expt. Sta.). (*Peninsula Hort. Soc. [Del.] Trans., 51 (1937), pp. 57–62, figs. 2*).—A severe outbreak of peach bacteriosis is reported in which the standard spray schedules failed because no fungicides

are usually applied until the young trees come into bearing, the fruit and leaves of young trees are probably more susceptible than those of older trees, high humidity and rainfall occurred, and infection was shown to have come directly from the nursery. A preliminary test of the hot water treatment of nursery stock gave little promise as a method of eliminating *Bacterium pruni* (=*Phytomonas pruni*) from budding stock. However, the growing of nursery stock in the greenhouse and in arid regions was found to eliminate the disease.

Control of brown rot on peaches must begin early, W. H. Martin. (N. J. Expt. Stas.). (*N. J. State Hort. Soc. News, 19 (1938), No. 3, pp. 999, 1000, fig. 1*).—This contribution discusses recommended procedures for the State.

Yellow blotch-curl: A new virus disease of the red raspberry in Ontario, G. C. Chamberlain (*Canad. Jour. Res., 16 (1938), No. 3, Sect. C, pp. 118–124, pls. 2*).—Studies of this disease of Cuthbert red raspberry are reported to indicate its distinctness from any previously described. It is characterized principally by a loose type of curling and a pale chlorotic foliage sometimes showing yellow blotching and ring spot. It was transmitted by the patch-graft method to the Cuthbert, Viking, Latham, Herbert, Chief, and Lloyd George varieties, and its different reactions were noted and are described.

The effect of pH on two strawberry root rot fungi, F. B. Wann and B. L. Richards. (Utah Expt. Sta.). (*Utah Acad. Sci., Arts, and Letters, Proc., 14 (1936–37), pp. 45, 46*).—From the results of the tests here briefly recorded it is suggested that a measure of control might be obtained by adjusting the soil reaction to a pH value corresponding to the minimum growth of the organisms involved (*Fusarium orthoceras* and *F. solani*).

The mode of action of bordeaux on Mycosphaerella fragariae, A. G. Plakidas. (La. Expt. Sta.). (*Phytopathology, 28 (1938), No. 5, pp. 307–329, figs. 2*).—In spraying strawberries in the field with bordeaux mixture, very little of the spray may reach the under leaf surfaces through which infection occurs, as shown by previous studies (E. S. R., 72, p. 68), yet effective control of the leaf spot is obtained by spraying. The present study has shown that conidia of *M. fragariae* are extremely sensitive to copper. Germination was prevented by exposing them to fresh or dried bordeaux mixtures for 30 min. or longer, followed by removal from the sphere of influence of the fungicide and washing. This indicates that the nongerminated spores were killed or permanently injured. Normal germination was not obtained even in as high a dilution as 0.33 p. p. m. of $CuSO_4$ (0.085 p. p. m. of metallic copper). The lime component of bordeaux mixture proved to be nontoxic, excellent germination being obtained in 1 percent lime smears on slides. Bordeaux spray greatly inhibited sporulation on infected (spotted) leaves, 7–10 times as many spores being found on unsprayed as on sprayed leaves. It is concluded that the action of bordeaux mixture is chiefly eradicative, reducing the amount of potential inoculum by greatly inhibiting sporulation, and killing the nongerminated spores in contact with it.

Soil fertility and experiments on bronzing of citrus, G. M. Bahrt and A. E. Hughes (*Fla. State Hort. Soc. Proc., 50 (1937), pp. 23–28, pls. 2, figs. 2*).—Of the bronzed leaves found in this study, 94 percent were on the next to the youngest growth or early spring flush, and four distinct types are described. As the stages of bronzing advanced, the magnesium content of the foliage decreased and the calcium/magnesium ratio increased. When magnesium was applied to the soil supplementary to the complete fertilizer, lower percentages of bronzing appeared to occur, and as a rule the highest fruit yields were on trees with the least bronzing. For correcting the trouble, the most promising treat-

ments are said to be calcined kieserite, dolomitic limestone, manganese sulfate, and ground calcium limestone supplemented by magnesium sulfate—in addition to the complete fertilizer.

Observations on psorosis of citrus in Florida, A. S. RHOADS. (Fla. Expt. Sta.). (*Fla. State Hort. Soc. Proc., 50 (1937), pp. 46–53, fig. 1*).—Data previously noted from another source (E. S. R., 78, p. 69) are presented.

Two nematodes associated with decaying citrus fruit, J. R. CHRISTIE (*Helminthol. Soc. Wash. Proc., 5 (1938), No. 1, pp. 29–33, figs. 2*).—*Hexatylus intermedius* n. sp., and *Prothallonema* n. gen. with *P. dubium* n. sp. are described and illustrated.

A Botrytis disease of the dahlia and its relation to Botrytis diseases of other plants, O. S. CANNON (*Utah Acad. Sci., Arts, and Letters, Proc., 14 (1936–37), pp. 41–43*).—This abstract of a thesis embodies studies indicating the pathogenicity of *B. cinerea* for the vegetative parts and roots of dahlia, successful cross inoculations with strains from a variety of host plants, and determinations of the general morphology, temperature relations, and mode of host penetration of the dahlia fungus.

Fusarium yellows of gladiolus, R. NELSON. (Mich. Expt. Sta.). (*Gladiolus [New England Gladiolus Soc.], 1938, pp. 124–131*).—This summarizes the present status of the disease and its control.

Cooperation in disease control demonstrated in 1937, L. M. MASSEY. (Cornell Univ.). (*Amer. Rose Ann., 1938, pp. 129–135*).—Further progress (E. S. R., 77, p. 807) is noted in this cooperative campaign for the control of diseases and pests of rose gardens. The 1937 returns from 80 collaborating growers are tabulated.

Rose anthracnose, A. E. JENKINS and L. M. MASSEY. (U. S. D. A. and Cornell Univ.). (*Amer. Rose Ann., 1938, pp. 136–141, pl. 1, figs. 3*).—This paper summarizes present information on the geographical range; the history, identity, and name of the disease; its symptoms, including the leaf-spot, stem-canker, and blossom-lesion phases, and differentiation from the more serious black spot; the life history of the causal fungus *Sphaceloma rosarum*; and recommended control measures.

Additional records of rose anthracnose in the United States, A. E. JENKINS and F. P. MCWHORTER. (U. S. D. A. and Oreg. State Col.). (*Phytopathology, 28 (1938), No. 5, pp. 360–363, fig. 1*).—Additional records of rose anthracnose (*Sphaceloma rosarum*) are reported from North Carolina, Oregon, Michigan, and Tennessee. In the region of Portland, Oreg., where anthracnose is prevalent, a large commercial planting kept dusted with sulfur was free from anthracnose when observed in September, and this was taken as an indication of control by this means.

Arkansas disease-control work in 1937, H. R. ROSEN. (Ark. Expt. Sta.). (*Amer. Rose Ann., 1938, pp. 146–148*).—This progress report on rose disease control indicates that sanitary measures for black spot must include not only the removal of all rose refuse, but also (and apparently more important for this section) the destruction of living leaves clinging to the plants, since they were shown to be responsible for overwintering the fungus. Kolotex dust applied once a week during the early part of the season gave promising results, but its continuance during July caused severe leaf burn. Two years' tests with mulches gave results unfavorable to this practice under Arkansas conditions.

Red copper oxide up to date, R. F. SUIT. (N. Y. State Expt. Sta.). (*Amer. Rose. Ann., 1938, pp. 153–157*).—The tests reported appear to indicate that for roses Cuprocide 54 removes all the difficulties of ordinary red cuprous oxide relative to suspensibility. A dosage of 2 oz. to 50 gal. of water caused no foliage

injury, but the addition of ⅛ percent emulsified cottonseed oil proved necessary for the efficient control of black spot and mildew. Notes are also included on other promising sprays for roses.

Control of stem and graft canker of the rose, E. W. LYLE and L. M. MASSEY. (Cornell Univ.). (*Amer. Rose Ann., 1938, pp. 142–145, fig. 1*).—Stem and graft cankers (*Coniothyrium fuckelii*) result in the death of parts or of entire plants. This study indicates that the fungus is a wound parasite not penetrating far beyond the limits of visible cankers, and that the disease may be largely controlled by removing diseased parts, making the cut at any node below the visibly diseased area. In either form of the trouble care should be exercised to leave no stubs of dead tissue.

Peppermint diseases and their control, R. NELSON. (Mich. State Col.). (*Mich. Muck Farmers Assoc. Proc., 18 (1936), pp. 44–54, figs. 3*).—This contribution describes and presents recommended control measures for the fungus-induced leopard spot and the *Verticillium* wilt or blight of peppermint.

Manganese sulfate as a corrective for a chlorosis of certain ornamental plants, R. D. DICKEY and W. REUTHER (*Florida Sta. Bul. 319 (1938), pp. 18, figs. 9*).—Chlorotic disorders of ornamentals were found to be rather common in various Florida sections, and one affecting crape myrtle (*Lagerstroemia indica*), *Buginvillaea*, *Allamanda cathartica*, Cattley guava (*Psidium cattleianum*), *Thunbergia grandiflora*, flame vine (*Bignonia venusta*), and *Agyneja impubes* is here described. The data presented indicate effective control by spray and soil treatments with $MnSO_4$ to crape myrtle, and by spray treatments to the other plants above named. Tentative recommendations are outlined. Certain plants are listed which are not injured by the spray mixture described, but caution is advised when treating untested plants. Further information is required before definite recommendations can be given for soil treatments.

Phytophthora cactorum associated with seedling diseases in forest nurseries, B. S. CRANDALL and C. HARTLEY (*Phytopathology, 28 (1938), No. 5, pp. 358–360*).—*P. cactorum* was isolated from seedlings of *Juglans nigra* with soil rot (North Carolina), of *Nyssa sylvatica*, *Colutea arborescens*, and *Caragana arborescens* with top wilt (Missouri), and of damped-off *Pinus nigra* (Maryland), and damping-off of tulip poplar seedlings and top wilt of European beech seedlings due to *Phytophthora cactorum* have been reported to the authors. In tests of the four strains of *P. cactorum* along with *P. pini* on *Pinus resinosa* only *Phytophthora pini* proved infective on this host.

Winter injury of Buxus sempervirens, L. W. R. JACKSON (*Phytopathology, 28 (1938), No. 5, pp. 372–374, fig. 1*).—The author describes the injury to the boxwoods from a severe freeze in late December, following a long period of warm weather. The principal symptom was a mechanical separation and exfoliation of the bark from the twigs and stems. *B. sempervirens suffruticosa* was not affected.

Preliminary recommendations for the control of the root and crown disease of cypress, J. A. MILBRATH and F. P. MCWHORTER (*Oregon Sta. Cir. Inform. 187 (1938), pp. 2*).—This disease of *Chamaecyparis lawsoniana* and varieties is shown to be due to *Phytophthora* sp. All species and varieties should be considered susceptible until proved otherwise.

Pucciniastrum on Epilobium and Abies, J. H. FAULL (*Jour. Arnold Arboretum, 19 (1938), No. 2, pp. 163–173*).—According to the author, this paper records for the first time the full life history of a *Pucciniastrum* from a *Lysimachia* host (*E. adenocaulon*). It develops its haploid generation on *A. balsamea*. Tests indicated that the rusts on *E. adenocaulon* and *E. angustifolium*, re

tively, are not cross infective on these hosts, though both infect *A. balsamea*. This infective specialization, together with morphological differences in the aecia and uredia, serves to separate the two rusts. The name *P. abieti-chamaenerii* Kleb. appeared acceptable for the rust on *E. angustifolium*, and *P. pustulatum* (Pers.) Diet. in part, for the other one. These rusts often cause severe damage to young trees of *A. balsamea* where the corresponding infected *Epilobium* hosts occur.

Berckman blight, J. A. MILBRATH (*Oregon Sta. Circ. Inform. 186 (1938), pp. 3*).—*Coryneum* sp. is shown to be the cause of this blight of *Thuja orientalis* and its varieties, which has proved destructive in Oregon nurseries and home gardens. Suggestions for its control are included.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Regulations relating to game, land fur animals, and birds in Alaska, 1938–39 (*U. S. Dept. Agr., Bur. Biol. Survey, Alaska Game Comn. Circ. 15 (1938), pp. 32, fig. 1*).—The annual digest of regulations relating to Alaska (E. S. R., 77, p. 808).

Experimental tagging of young muskrats for purposes of study, P. L. and C. S. ERRINGTON. (Iowa Expt. Sta.). (*Jour. Wildlife Mangt., 1 (1937), No. 3–4, pp. 49–61, pls. 2, fig. 1*).—The details are presented in four tables.

Revision of the North American ground squirrels, with a classification of the North American Sciuridae, A. H. HOWELL (*U. S. Dept. Agr., Bur. Biol. Survey, North Amer. Fauna No. 56 (1938), pp. 256, pls. 32, figs. 20*).—Following a brief introduction in which the geographic distribution of the ground squirrels is considered, their habits and economic relations (pp. 4–33), classification of the North American Sciuridae, represented by 10 genera (pp. 34–52), and a revision of the genus *Citellus*, with descriptions of 4 new forms (pp. 53–216), are dealt with. A bibliography of 10 pages is included.

The tick parasite Ixodiphagus texanus in nymphs and larvae of Haemaphysalis leporis-palustris in Minnesota, C. L. LARSON (*Jour. Parasitol., 23 (1937), No. 5, pp. 496–498*).—The rearing of the tick parasite *I. texanus* from nymphs of the rabbit tick taken from four different rabbits in Minnesota in 1934 is reported. The earlier recoveries of this parasite were made in Texas and Idaho.

A new species of bladder fluke, Gorgoderina tanneri (Gorgoderidae: Trematoda), from Rana pretiosa, O. W. OLSEN. (Minn. Expt. Sta.). (*Jour. Parasitol., 23 (1937), No. 5, pp. 499–503, figs. 6*).—Under the name *G. tanneri* a species of the genus *Gorgoderina*, found in about 80 percent of the *R. pretiosa* collected at Springville, Utah, is described as new. A key to the species of *Gorgoderina*, 14 in number, and a list of 11 references to the literature are included.

A new species of trematode, Diasia podilymbae (Opisthorchiidae), from the pied-billed grebe (Podilymbus podiceps (Linn.)), O. W. OLSEN. (Minn. Expt. Sta.). (*Jour. Parasitol., 24 (1938), No. 3, pp. 215–218, figs. 7*).—A trematode from the mesentery of a pied-billed grebe from Minnesota is described as *D. podilymbae* n. sp.

[Notes on economic insects and their control] (*Jour. Econ. Ent., 31 (1938), No. 2, pp. 316–323, figs. 6*).—The contributions presented (E. S. R., 79, p. 75) include: An Economical, Portable Light for Collecting Nocturnal Insects, by B. D. Burks, H. H. Ross, and T. H. Frison (pp. 316–318); *Aphomia gularis* Zeller as a Pest of Prunes, by H. C. Donohoe, P. Simmons, and D. F. Barnes (p. 318); *Glossonotus crataegi* Fitch Susceptible to Dormant Oil Sprays, by S. W. Harman (pp.

318, 319) (N. Y. State Expt. Sta.); Cottonseed-Hull Bran in Grasshopper Bait, by R. E. Hutchins and C. Lyle (p. 319); Higher Ketones as Intermediary Solvents for Derris Resinate Used in Petroleum Spray Oil, by J. P. La Due (pp. 319, 320), and Methyl Iodide as a Fumigant, by D. L. Lindgren (p. 320) (both Calif. Citrus Sta.); Bacteria Isolated From the Gut of Larval *Agriotes mancus* (Say), by R. M. Melampy and G. F. MacLeod (p. 320); Massing of Convergent Ladybeetle at Summits of Mountains in Southeastern United States, by F. Sherman (pp. 320–322) (S. C. Sta.); Organic Compounds Highly Toxic to Codling Moth Larvae, by L. E. Smith, E. H. Siegler, and F. Munger (pp. 322, 323); Synonymy of the *Euscepes* Sweetpotato Weevil (Coleoptera, Curculionidae), by E. C. Zimmerman (p. 323); and Distribution of Elm Bark Beetles in Massachusetts, by W. B. Becker and W. E. Tomlinson (p. 323) (Mass. Sta.)

[Work in economic zoology and entomology by the Arizona Station] (*Arizona Sta. Rpt. 1937, pp. 50, 54–56*).—The report of the year (E. S. R., 78, p. 72) includes work relating to seasonal utilization and forage requirements on range vegetation by rodents; range rodent (*Neotoma albigula*) investigations; range grasshoppers; and scale insects (Coccidae) of Arizona, especially the effect of climate on the olive parlatoria *Parlatoria oleae* Colv. and spraying for the control of *Toumeyella mirabilis*.

[Work with economic insects and zoology by the Florida Station]. (Partly coop. U. S. D. A.). (*Florida Sta. Rpt. 1937, pp. 70, 71–74, 131, 132, 141, 142, 146, 147*).—The work of the year referred to (E. S. R., 77, p. 65) includes the discovery in Florida of the South American weevil *Naupactus leucoloma* Boh.; efforts to control the Florida flower thrips *Frankliniella cephalica bispinosa* Morg. and the introduction and propagation of beneficial insects (including efforts to spread *Leis dimidiata 15-spilota* Hope), both by J. R. Watson; the southern green stinkbug and its parasitization by *Trichopoda pennipes*, by H. E. Bratley; measures to control the nut casebearer, by S. O. Hill, Watson and Bratley; the onion thrips, by Watson; the gladiolus thrips, by Watson an[d] J. W. Wilson; the biology and control of Florida aphids, including the citru[s] aphid *Aphis spiraecola* Patch, by A. N. Tissot; the pepper weevil, by C. C. Go[ff] (E. S. R., 77, p. 668); control of the purple scale, the Florida red scale, an[d] white flies with lime-sulfur and copper sprays at the Citrus Substation, by W. I Thompson; and cutworms and the giant toad (*Bufo marinus*), bean jassid[s] wireworms, aphids, the corn earworm, studies on the prevalence and control [o] the sugarcane borer in south Florida, and studies of the prevalence and contr[ol] of rodents under field and village conditions, all by R. N. Lobdell at the Eve[r]glades Substation.

[Work in economic entomology, zoology, and parasitology by the Haw[aii] Station] (*Hawaii Sta. Rpt. 1937, pp. 38, 42, 86–110, figs. 4*).—Reporting for t[he] year (E. S. R., 76, p. 820), the work referred to includes the Chinese rose bee[tle] *Adoretus sinicus* and *Lycaena baetica* as pests of beans, by G. K. Parris a[nd] K. Kikuta; the tomato fruitworm (*Phthorimaea* sp.), the corn earworm, [the] melonfly, and the hemipteran *Engytatus geniculatus* as pests of tomatoes, by Parris; studies on liver flukes of cattle, including the occurrence and [life] history of *Fasciola gigantica* in Hawaii (E. S. R., 77, p. 521), by J. E. Alica[ta] experimental feeding of liver fluke cysts to a horse and a mule, by Alicata [and] L. E. Swanson, experiments on active immunity to liver flukes in rabbits an[d] calf, by Alicata, and liver fluke control—methods, by Swanson, manure disp[osal] and care of water troughs, use of the fire torch, and economic losses due to l[iver] flukes, all by G. W. H. Goo, and drug experiments, by Swanson and Goo; stu[dies] of poultry parasites, including parasites of chickens in Hawaii and contro[l of] the Surinam roach—the carrier of eyeworms of poultry, both by Alicata; stu

of parasites of swine, also by Alicata; and rodent control, including life history, trap, and poison bait studies, and field operations, by H. J. Spencer, H. G. Hansen, and [W.] Jordan.

[Work in entomology and economic zoology by the Iowa Station]. (Partly coop. U. S. D. A.). (*Iowa Sta. Rpt. 1937, pts. 1, pp. 140–155, figs. 11; 2 pp. 58, 59, fig. 1*).—The work of the year reported (E. S. R., 77, p. 215) related in part 1 to the influence of meteorological factors upon honey production, by O. W. Park; wheat insect pest survey and biology and control of onion insects, both by C. J. Drake; insects and insect toxicology as relates to housefly and grasshopper (two-striped grasshopper) baits, by C. H. Richardson; studies on the races of bees, by Park; survey of potato insects, by Drake; emergency insect investigations, by Drake and Richardson; bionomics and control of the codling moth and apple maggot, by Richardson; apple leafhoppers; factors involved in the transmission of nectar into honey by the honeybee, by Park; quail (*Colinus virginianus virginianus*) and duck management, by L. J. Bennett; analysis of environmental carrying capacity for wintering bobwhite quail, by P. L. Errington; ecology of the muskrat, by Errington (E. S. R., 78, p. 657; 79, p. 71); variation in resistance to American foulbrood in honeybees, by Park, F. B. Paddock, and F. C. Pellett (E. S. R., 77, p. 520); supersedure of queens by honeybee colonies, by Park and Paddock; and the life history, ecology, and management of the striped skunk (*Mephitis mesomelas avia*) and the spotted skunk (*Spilogale interrupta*), by Bennett.

Part 2 reports on white grub investigations, by C. J. Drake and E. V. Collins; the ecology and control of sod webworms in permanent pasture and cultivated fields, by G. C. Decker; and the bionomics and control of the chinch bug, by Drake, Richardson, and Decker.

[Report of work in economic entomology by the Kentucky Station]. (Partly coop. U. S. D. A.). (*Kentucky Sta. Rpt. 1937, pt. 1, pp. 41, 43–47, 48, 49*).—The work of the year reported (E. S. R., 77, p. 814) includes corn earworm control; control of the sod webworm; the resistance of clover to pea aphid infestation; control of insects injurious to tobacco plants in the bed (E. S. R., 78, p. 373); control of wireworm injury to tobacco in the field; corn earworm studies; trapping for the Japanese beetle; the introduction of parasites (principally *Dioctes molestae*) to control the oriental fruit moth; a May beetle survey; the identification of white grubs; tests with oil-nicotine sprays (E. S. R., 78, p. 75); codling moth; and the biology and control of the strawberry crown borer.

[Work in entomology by the Massachusetts Station] (*Massachusetts Sta. Bul. 347 (1938), pp. 54–68*).—The work of the year referred to (E. S. R., 77, p. 814) includes oil sprays for dormant applications for control of the European red mite, substitutes for lime-sulfur in summer sprays for orchards, sprays to control the white apple leafhopper, summer sprays for the European red mite, control of the squash vine borer, control of the striped cucumber beetle on melons, control of the cabbage maggot with mercury compounds, and control of the apple maggot, all by A. I. Bourne and W. D. Whitcomb; control of the onion thrips, the spray residue problem, the introduction of parasites (*Macrocentrus ancylivorus*) of the oriental fruit moth in peach orchards (in cooperation with the Connecticut [New Haven] Experiment Station), potato spraying experiments, and insecticides for the control of the European corn borer, all by Bourne; insects (the smaller European elm bark beetle and the native elm bark beetle) concerned in the dispersal of Dutch elm disease, and other elm-boring insects, both by W. B. Becker; the apple leaf-curling midge *Dasyneura mali* Kieff., control of the plum curculio in apples, the biology and

control of the carrot rust fly, control of the red spider on carnations and greenhouse plants, and naphthalene and similar compounds as greenhouse fumigants, all by Whitcomb; and the adaptability of *Cryptolaemus montrouzieri* to control of mealybugs in the greenhouse, by Whitcomb and W. Garland.

[Work with insects by the Nebraska Station] (*Nebraska Sta. Rpt. [1937], pp. 35, 36–38*).—The work of the year reported upon (E. S. R., 77, p. 657) includes control of major field crop and other injurious insect pests, with particular reference to the chinch bug, hessian fly, flatheaded apple tree borer, and alfalfa weevil; grasshopper control (E. S. R., 78, p. 663); and a brood study of the codling moth in southeastern Nebraska.

[Work in entomology by the New Hampshire Station] (*New Hampshire Sta. Bul. 304* (*1938*), *pp. 35, 36*).—The work of the year (E. S. R., 78, p. 73) relates to a study of contact insecticides (the establishment of a suitable technic for measuring the rate of penetration of oils through insect integument, using the American cockroach as the experimental insect), by W. C. O'Kane, L. C. Glover, and W. A. Westgate, and an outbreak of the European spruce sawfly.

Insect control (*Rhode Island Sta. Rpt. [1937], p. 12*).—Brief reference is made (E. S. R., 77, p. 814) to the satisfactory control of the Mexican bean beetle and the imported cabbageworm on cabbage and cauliflower with rotenone dust and to the use of corrosive sublimate for the control of the cabbage maggot.

[Work in entomology by the South Dakota Station], H. C. Severin (*South Dakota Sta. Rpt. 1937, pp. 21–24*).—The work of the year (E. S. R., 77, p. 67) reported upon relates to grasshoppers of the subfamily Cyrtacanthacrinae of South Dakota—their economic importance, distribution, life histories, and control, and a study of the blister beetles (Meloidae) of economic importance in the State.

[Contributions on entomological technic] (*U. S. Dept. Agr., Bur. Ent. and Plant Quar., 1937, ET–111, pp. 2, pls. 2; ET–112, pp. 2, pl. 1; ET–113, pp. 2, pl. 1 ET–114, p. 1, pl. 1; ET–115, pp. 3, pls. 2; ET–116, p. 1, fig. 1; ET–117, p. 1 fig. 1; 1938, ET–118, p. 1; ET–119, p. 1, pl. 1; ET–120, pp. 3, pls. 2*).—Furthe contributions (E. S. R., 78, p. 363) are A Convenient Field Cage for Individua Insects (ET–111), by R. L. Beard (Conn. [New Haven] Expt. Sta.); A Machin for the Examination of Flies (ET–112), by A. W. Lindquist; An Apparatus fo All-Season Sampling for the Study of Insects (ET–113), by F. H. Harries an D. E. Fox; A Motor-Driven Telescoping Stirrer for Use With an Insectici Spraying Apparatus (ET–114), by L. D. Goodhue and E. H. Siegler; A Efficient Method for Mixing Large or Small Quantities of Insecticidal Dus Containing a Conditioner (ET–115), by T. E. Bronson (E. S. R., 77, p. 216 Insect Feeder (ET–116) and Insect Holder (ET–117), both by C. W. Eagleso An Artificial Shipping Medium for Young Larvae of *Cochliomyia america* (ET–118), by R. Melvin; A Hood for Use in Examining Material Containi Irritating Dust (ET–119), by H. C. Donohoe, D. F. Barnes, and P. Simmo and A Method for Infesting Lemon Fruit With [California] Red Scale (E 120), by F. Munger.

[Contributions on economic insects, insecticides, and insect contr (*U. S. Dept. Agr., Bur. Ent. and Plant Quar., 1938, E–428, pp. 4; E–429, pp. pls. 7; E–430 pp. 5; E–431, pp. 8, pl. 1; [E–432, pp. 4, figs. 5]; E–433, pp. E–434, pp. 4, pls. 2; E–435, pp. 6, pl. 1; E–436, pp. 20, pls. 2; E–437, pp. 8, pls E–438, pp. 6, pl. 1*).—The following contributions are in continuation of series (E. S. R., 79, p. 358): Tank-Mix Nicotine-Bentonite for Control of Codling Moth (E–428), by L. F. Steiner, R. F. Sazama, J. E. Fahey, and H. Rusk; Development of Insect Infestation in Wheat Stored on Farms in ... States (E–429), by R. T. Cotton; A Mixture of Sulphur and Cal

Arsenate for Control of the Cotton Flea Hopper and the Boll Weevil (E–430), by K. P. Ewing and R. L. McGarr (coop. Tex. Expt. Sta.); Boll Weevil Control in the South Atlantic States (E–431), by F. F. Bondy (coop. S. C. Sta.); The White-Fringed Beetle [*Naupactus leucoloma* Boh.] ([E–432]); Insecticide Program for Raspberry Fruitworm Control (E–433), by S. E. Crumb (E. S. R., 73, p. 504); An Efficient Method for Introducing Liquid Chemicals into Living Trees (E–434), by A. E. Lantz; Suggestions for the Control of the Pea Weevil in the Pacific Northwest (E–435) (coop. Idaho, Wash., and Oreg. Stas.) (E. S. R., 75, p 511); Cooperative Tests of Housefly Sprays, 1935–36 (E–436), by F. L. Campbell; Changes in the Insect Population of Stored Raisins (E–437), by P. Simmons and H. C. Donohoe; and Equipment and Procedure for Longevity Studies With Caged Honeybees (E–438), by A. W. Woodrow (coop. Wyo. Sta.).

Some of the principles governing the production of air-floated oil particles and their relation to the toxicity of contact oil sprays to insects, R. C. Burdette (*New Jersey Stas. Bul. 632 (1938), pp. 31, figs. 9*).—A study designed to reveal the nature of the fog or air-float produced by atomizing a light oil of definite specification into the atmosphere as is usually done for the destruction of flies in houses and barns, undertaken in the hope of learning how the most efficient spray of this character could be produced, is reported.

It was found that the light oil employed when atomized in the atmosphere forms a fog, otherwise known as air-float, consisting of (1) a little less than one-half of the total delivered oil in droplets of ultramicroscopic sizes and possibly partly of gas, and (2) a little more than one-half of the total delivered oil in droplets of 1μ or more in diameter. "In still air all droplets greater than 10μ in diameter settle out of the air suspension in about 4 min. Toxicity of the fog or air-float to honeybees lies mostly in that portion consisting of droplets ranging from 1μ to 10μ in diameter. The structure of the fog or air-float is the result of the interaction of the flow of air and liquid, which in turn depends on size of orifice and pressure. This structure can be varied at will by proper manipulation of these physical factors. For maximum kill, sufficient material of the optimum structure of droplets (1μ to 10μ) must be atomized to produce a concentration of 0.03 cc per cubic foot of air. Increasing temperatures between 50° and 90° F. are accompanied by increased kill. Varying moistures ranging from 29 to 90 percent relative humidity have little, if any, effect on percentage kill."

Insecticidal tests against red spiders and thrips on greenhouse tomatoes and cucumbers, C. A. Weigel and R. H. Nelson. (U. S. D. A.). (*Jour. Econ. Ent., 31 (1938), No. 2, pp. 211–216*).—The composition of sprays tested against the common red spider and the onion thrips on greenhouse tomatoes and cucumbers and the results of two series of spraying tests against the common red spider on greenhouse tomatoes and cucumbers at Beltsville, Md., in 1937 are reported upon, the details being given in two tables.

The results indicate that (1) a derris spray having a rotenone content of 0.0056 percent is as effective as one with a 0.0112 percent rotenone content when sulfonated castor oil is used as a spreader, (2) the derris sprays used in these tests are superior to cube sprays of the same rotenone content, the difference being explainable on the basis of the total extractives, (3) the addition of pyrethrum extract aids in killing thrips but does not improve the spray's effectiveness against the red spider, (4) with sprays of the same rotenone content with sulfonated castor oil as a spreader, the kill is better than with either alkylphenylbenzenesulfonic acid or ammonium caseinate with rosin residue, and (5) proprietary thiocyanate spray is as effective as the derris spray plus sulfonated castor oil. None of the derris or cube sprays plus the spreader or

the proprietary thiocyanate caused any permanent injury to either tomato or cucumber. The lauryl thiocyanate spray with a sodium oleyl sulfate plus synthetic resin spreader caused severe injury to both the foliage and fruit of tomato. The beneficial effect was clearly shown by the fact that the foliage of the sprayed plants remained greener and the plants continued to bear fruit much longer than the check plants, and the average number of living red spiders per leaf in the sprayed plants was very low in contrast to the checks.

Complexity of calcium arsenate as revealed by chemical analysis of fractions of different particle size, L. D. GOODHUE and C. C. CASSIL (*Jour. Econ. Ent., 31 (1938), No. 2, pp. 278–280, fig. 1*).—In further studies (E. S. R., 77, p. 509) a sample of calcium arsenate was separated into several fractions by an air classifier. "The particle-size distribution was determined on the original sample and on three fractions, the finest and coarsest and one intermediate between these two. Analyses of these fractions showed a great variation in chemical composition, indicating that a chemical as well as a mechanical separation was accomplished. The fine particles were found to contain more arsenically combined calcium oxide than the coarse ones and, therefore, much less water-soluble arsenic."

Sorption of hydrocyanic acid by different species of insects, E. L. CARPENTER and W. MOORE (*Jour. Econ. Ent., 31 (1938), No. 2, pp. 270–275, figs. 3*).—Measurements made of the quantities of hydrocyanic acid absorbed during different time intervals at several pressures of hydrocyanic acid by five different species of insects, namely, the rice weevil, confused flour beetle, German cockroach, yellow mealworm, and cigarette beetle, are reported. The amount of hydrocyanic acid absorbed was found to vary with the species, those generally known to be difficult to kill having absorbed smaller quantities of hydrocyanic acid than those that are easily killed. The amount absorbed was found to be considerably greater at 20° than at 30° C.

Dusting for control of citrus pests, O. C. FRENCH. (Calif. Expt. Sta.) (*Agr. Engin., 19 (1938), No. 4, pp. 165, 166, 169, figs. 6*).—Dusting equipmen developed by the station is briefly described.

Difficulties encountered in field dusting experiments, F. S. ARANT (*Jou Econ. Ent., 31 (1938), No. 2, pp. 314, 315*).—A brief discussion of the difficulti encountered in field dusting experiments.

Occurrence of the beet leafhopper and associated insects on seconda plant successions in southern Idaho, D. E. FOX (*U. S. Dept. Agr., Tech. B 607 (1938), pp. 44, figs. 4*).—A study made during the years 1928–33 of t successions of plant cover on newly abandoned lands in southern Idaho and al a similar but less detailed study of a general breeding area of the beet leafhop are reported. Insect populations were recorded at each stage of the change plant cover as the succession proceeded from abandoned land to Russian-this (*Salsola pestifer*), to the mustards (flixweed (*Sophia parviflora*) and tumb mustard (*Norta altissima*)), and finally to an annual grass (downy chess (*B mus tectorum*)). Complex insect populations were found on the mustards simple populations on Russian-thistle, while only a few individuals of inciden species were found on the annual grass. The simple but dense populations Russian-thistle consisted of only a few species in which the beet leafhop always predominated. The complex populations on the mustards were made of a large number of species. These included the beet leafhopper, but the mot plant bug *Melanotrichus coagulatus* and the mustard flea beetle *Phyllotreta onica* predominated. The insect species found on sagebrush differed mark from those occurring on the annual weeds. None of the economically impor ... of the sagebrush fauna. The sage leafho

Empoasca aspersa predominated on sagebrush, but this species and others of the sagebrush fauna rarely occurred on the annual weeds or on cultivated crops.

A list given of 11 references includes the report of similar work conducted in California by Piemeisel and Lawson (E. S. R., 78, p. 76).

Recent problems on Long Island in the control of bean insects, H. C. Huckett. (N. Y. State Expt. Sta.). (*Jour. Econ. Ent., 31 (1938), No. 2, pp. 266–270*).—A comparison is made of the effectiveness of two cube powders in spray and dust mixtures for the control of foliage parasites of beans on Long Island. "The powders were used in combination with sulfur sprays at the rate of 4 lb. per 100 gal. and in dust mixtures at 10 lb. in 100 lb. of complete mixture. According to larval population counts of *E[pilachna] varivestis* and yield of pods, mixtures containing cube powder of 2 percent rotenone and 18 percent total ether extractives were as effective at the dosages used as those containing cube powder of 5 percent rotenone and 12 to 14 percent total ether extractives. One season's applications of sulfur dusts did not affect the soil acidity as measured by the pH. In field tests on lima beans sprayed and dusted with copper-lime mixtures for control of plant diseases it was observed that bordeaux mixture, as applied, possessed considerable merit in that it had notably reduced the amount of feeding by *E. varivestis*. This effect, it was observed, was slightly enhanced by the addition of cube powder to the mixture at the time of application or by making separate applications of cube-clay dusts following treatment with bordeaux mixture."

Results of potato dusting experiments on organic soils, H. Menusan, Jr. (*Jour. Econ. Ent., 31 (1938), No. 2, pp. 259–262*).—Continuing earlier work (E. S. R., 78, p. 367), field experiments in dusting and spraying Irish Cobbler and Smooth Rural potatoes grown on organic soils in western New York conducted during the seasons 1933–37, inclusive, are reported.

"Although bordeaux spray gave a better control of insect pests than copper-lime dust, no marked differences in yields were obtained between dusted and sprayed potatoes. Sulfur dusts applied to dry foliage gave consistent, but usually not statistically significant, increases in tuber yields over copper-dusted potato plants. Further increases in yields which were not statistically significant were obtained by adding pyrethrins or nicotine to the sulfur dusts. A copper-lime-sulfur dust has given the largest tuber yields in 1937 with both varieties of potatoes used in the experiments. This promising dust combination warrants further study in the control of potato insects and diseases. A large part of the tuber yield increases obtained with the dust and spray treatments on muck-land potatoes could be attributed to the control of the potato leafhopper. Some of the differences in yield obtained may also be due to differences in the physiological response of the potato plant to the different treatments."

[Work with cranberry insects by the Massachusetts Station], H. J. Franklin (*Massachusetts Sta. Bul. 347 (1938), pp. 42–44*).—This report of the work of the year with injurious and beneficial cranberry insects at the Cranberry Substation (E. S. R., 77, p. 815) includes the grape anomala *Anomala errans* F., the cranberry weevil, the fire beetle *Cryptocephalus incertus* Oliv., the cranberry fruitworm, impregnated pyrethrum dust to control the gypsy moth and blunt-nosed leafhoppers (*Ophiola*), and notes on cranberry pests.

Shade tree insects and sprays, 1937, E. P. Felt and S. W. Bromley (*Jour. Econ. Ent., 31 (1938), No. 2, pp. 173–176*).—In continuation of the annual summary of shade-tree insects (E. S. R., 77, p. 67), notes for the year 1937 relate to those found attacking holly, dogwood, elm, filbert, beech, rhododendron, and various deciduous trees.

Tartar emetic as a field spray against the gladiolus thrips, R. H. Nelson (U. S. D. A.). (*Jour. Econ. Ent., 31 (1938), No. 2, pp. 208–211*).—Investigations conducted at Beltsville, Md., during the year 1937 indicate that "combinations of tartar emetic and brown sugar are not injurious to gladiolus foliage, result in thrips control equal to that obtained with paris green and brown sugar, and have no deleterious effect upon new corm production; an effective mixture of tartar emetic and brown sugar can be prepared for less cost than a spray of paris green. With the tartar emetic, the amount of brown sugar can be reduced to one-fourth of that commonly used with arsenicals without affecting the control obtained. Apparently the sprays must be sweetened, however, since the substitution of a spreader-sticker for the brown sugar resulted in poor control with both tartar emetic and paris green."

Spraying and dusting to control the potato leafhopper on peanuts in Virginia, E. T. Batten and F. W. Poos. (Coop. U. S. D. A.). (*Virginia Sta. Bul. 316 (1938), pp. 26, figs. 9*).—Control experiments for the potato leafhopper on peanuts, considered the most important insect pest of this crop in Virginia, conducted in 1935, 1936, and 1937, are reported year by year, the details being given in tables. A discussion of peanut leaf spot, by H. T. Cook, is included.

The eggs are deposited in the petioles or larger veins of the leaves, where they usually hatch within 4 to 9 days during the summer. There are five immature or nymphal stages of this insect, which resemble the adult in shape but do not have full-grown wings. The period required for this insect to develop from egg to adult, under the most favorable conditions, is about 3 weeks. The potato leafhopper is often extremely abundant on peanuts in Virginia and in North Carolina during July and August and damages the plants by piercing the leaves and petioles and sucking the juices from them. A burning of the tips and margins of the leaves and a yellowing and dwarfing of the foliage are common symptoms of the diseaselike injury by this insect.

Preliminary tests conducted at Arlington in 1932 and 1933 and at Holland in 1934 indicated that three applications of 4:4:50 bordeaux mixture applied as a spray gave remarkable increases in yields of peanuts. The tests reported which were made at Holland during the 3 yr. following confirmed the results "In addition to the bordeaux mixture, which was applied as a dust as well as a spray, copper carbonate and copper phosphate were tested as sprays, and sulfur and pyrethrum-sulfur were applied as dusts. The results of these experiments indicated clearly that either bordeaux mixture applied as a spray or sulfur applied as a dust produced very profitable increases in yields of both field-cured peanuts and peanut-vine hay. Shelling tests indicated no significant difference in the weight of individual meats and in number of nut meats per pod between samples from the treated plats and those from the untreated plats.

"On the basis of the results presented in this bulletin, three applications of bordeaux mixture as a spray or three applications of sulfur as a dust are recommended, the first treatment to be made about July 10 to 15 and this being followed by two more treatments at intervals of approximately 21 days."

Ecological studies of the white apple leafhopper (Typhlocyba pomaria McAtee), W. J. Schoene. (Va. Expt. Sta.). (*Jour. Econ. Ent., 31 (1938), No. 2, pp. 229–232, fig. 1*).—Observations have shown that the white apple leafhopper is usually abundant only in sprayed orchards and especially on the more succulent, rapid-growing apple varieties, such as Stayman Winesap and Delicious. It appears that the sprays commonly used in orchards for the control of orchard insects and diseases have very little direct influence on the feeding and oviposition. No evidence is at hand as to the effect of spray mixtures on the ins[illegible] white apple leafhopper. Under certain conditions, the ins[illegible]

is parasitized by a fungus [*Entomophthora sphaerosperma*]. In 1935 and 1937 this fungus greatly reduced the number of leafhoppers in certain orchards; but field observations indicate that this fungus is held in check by applications of lime-sulfur early in the season and by heavy and repeated applications of bordeaux late in the season."

Effects of orchard practices on natural enemies of the white apple leafhopper, H. M. STEINER. (N. Y. State Expt. Sta.). (*Jour. Econ. Ent., 31 (1938), No. 2, pp. 232–240, figs. 2*).—Work, the details of which are given in tables and graphs, has shown that the effectiveness of natural enemies in controlling the white apple leafhopper is reduced by certain horticultural practices. "Watersprouts when permitted to grow in abundance in orchards of low vigor may harbor more eggs per unit of surface area than other branches, but the rate of parasitism of eggs in watersprouts is lower. The population of the predator *Diaphnidia pellucida* is reduced by dormant applications of lubricating oil emulsion which kill the overwintering eggs. *D. pellucida* is also reduced in numbers by applications of contact insecticides if these are applied when the early nymphal stages of the predator are present. The population of *Aphelopus typhlocybae* is reduced by cultivating beneath the spread of the branches during periods when the parasites are in cocoons in the soil. The population of this nymphal adult parasite is also reduced by certain sprays which kill leafhopper nymphs, but is apparently not affected by sprays of wettable sulfur and lead arsenate applied during the period when adult parasites are attacking the leafhopper nymphs. When the earlier hatching and more heavily parasitized leafhoppers are killed by contact insecticides and the later hatching nymphs are permitted to reach the adult stage, the percentage of parasitism is greatly lowered.

"A spray applied for leafhopper adults at the time when most of the *Aphelopus* larvae have matured and left the hosts, when most of the *Anagrus* adults of the second emergence from overwintering eggs have appeared, and when most of the *Diaphnidia* eggs have been laid has produced some immediate reduction in the population of leafhoppers of the following generation and permitted a greater reserve of natural enemies to remain in the orchard than when sprays were applied for nymphs. The percentage of eggs parasitized in the foliage by *A. armatus* variety *nigriventris* appears to be reduced more by sprays which have killed off the earlier hatching leafhoppers of the first generation, and reduced the number of eggs available to the parasites at the time of their emergence, than by subsequent sprays of the standard schedule. The insecticides tested against leafhopper nymphs of the second generation have had no appreciable effect on *Anagrus* parasites remaining in the foliage or in the bark."

Leafhopper migration across Delaware Bay, L. A. STEARNS and D. MACCREARY. (Del Expt. Sta.). (*Jour. Econ. Ent., 31 (1938), No. 2, pp. 226–229*).—Records of leafhoppers collected from lighthouses in Delaware Bay in 1936, the details of which are given in table form, indicate clearly that a great natural barrier, such as the Delaware Bay, is in reality but a slight hindrance to their migration when conditions are favorable for it.

Studies on the life history of the pineapple mealybug (Pseudococcus brevipes (Ckll.)), K. ITO. ([Hawaii.] Pineapple Producers' Expt. Sta.). (*Jour. Econ. Ent., 31 (1938), No. 2, pp. 291–298, figs. 3*).—Studies of the life histories of the two forms of the pineapple mealybug under laboratory conditions are reported, the details being given in five tables. "It was found that the pink form reproduced parthenogenetically, producing only females, while the gray form reproduced sexually, producing both males and females. The females of both forms molted three times before reaching maturity. The average num-

ber of progeny produced by 64 pink females was 234 and by 20 gray females was 347. The average length of life of the pink females was 90 days, of the mated gray females 95 days, and of 39 unmated gray females 148 days. The males molted four times before reaching the winged, adult stage. They fed only during the first and part of the second instar. They lived for an average length of 37 days. The winged adults spent an active life of about 2 days from the time of emerging from their cocoons until death."

The scurfy scale and its control, O. H. Hammer. (N. Y. State Expt. Sta.). (*Jour. Econ. Ent., 31 (1938), No. 2, pp. 244–249, figs. 3*).—This is a detailed account of work of which a brief account has been noted (E. S. R., 78, p. 667).

Experiments for control of the pine needle scale (Chionaspis pinifoliae (Fitch)), F. L. Gambrell. (N. Y. State Expt. Sta.). (*Jour. Econ. Ent., 31 (1938), No. 2, pp. 183–186*).—Control experiments with the pine needle scale in 1936 and 1937 are reported, the details being given in three tables. It is concluded that, while these experiments have not been conducted over a sufficient period to make definite recommendations, "(1) coal-tar oil and DN-oil appear to be the best possibilities for use in dormant treatments, under the conditions of these tests, if diluted properly and (2) the use of nicotine sulfate with soap, nicotine sulfate with oil, and oil sprays alone are effective in controlling the young crawlers. The oil and nicotine sulfate mixture possesses an added advantage of extending somewhat the normal effective spraying period of such a mixture as compared with nicotine sulfate and soap, since it is possible to obtain satisfactory control with the former mixture even after the nymphs have settled down and begun to secrete the scale. This fact was demonstrated during 1937 when an application of 2 gal. of summer oil emulsion and 2 qt. of nicotine sulfate to 100 gal. of water, applied July 10 for control of the first brood, gave an excellent kill."

Sucking lice (Anoplura) on marmots, O. W. Olsen. (Minn. Expt. Sta.). (*Jour. Parasitol., 24 (1938), No. 3, p. 281*).—The sucking louse *Neohaematopinus marmotae* Ferr. is recorded as having been collected from *Marmota flaviventris nosophora* in Montana in 1936. Reference is made to records of other species of *Anoplura* on this and other woodchucks found in an examination of the literature.

Metabolism in the corn ear worm.—I, Studies on fat and water, L. P. Ditman (*Maryland Sta. Bul. 414 (1938), pp. 183–206, figs. 11*).—The author finds that the variation of food of the larvae of the corn earworm is reflected in changes in the chemical composition of mature larvae and pupae. "Prepupae and pupae from larvae maturing on milk-stage corn contain a higher percentage of water and a lower percentage of fat than do those maturing on dough-stage corn. There appears to be a pronounced fat-water relationship, the percentage of water varying inversely with the percentage of fat during the prepupal and pupal periods under humid conditions. The actual fat content and percentage of fat on a basis of dry weight increase during the prepupal period. In consideration of the relatively rapid decrease of glycogen during this period (unpublished results), a conversion of glycogen to fat is indicated.

"The iodine value of fat from prepupae and pupae from larvae reared o[n] milk-stage corn is lower than the iodine value of fat from those reared on dough stage corn. The small amount of fat in milk-stage corn and the fact that larv[ae] feeding on this food store a more saturated fat suggests a synthesis of fat fro[m] carbohydrate in the food. The iodine value decreases considerably during t[he] pupal period at a temperature of 86° $\pm$ 1° F., more so in insects reared on mil[k-] stage corn than in those reared on dough-stage corn, indicating that the mo[...] [illegible] period. The iodine value of fat do[...]

not decrease when pupae are subjected to a temperature of 41°± 3° for 10 days or more, but when pupae are restored to 86° ± 1° the iodine value decreases slightly in pupae from larvae reared on milk-stage corn but does not change in insects reared on dough-stage corn. Insects reared at a high temperature have a lower iodine value than those reared at a lower temperature.

"The saponification value of the fat from prepupae and pupae reared from larvae fed on milk-stage corn tends to be slightly higher than the saponification value of the fat from prepupae and pupae from larvae reared on dough-stage corn.

"The reduced percentage of moisture, the increased percentage of fat, and the reduced saturation of fat, all intensified by a diet of dough-stage corn, are factors generally associated with the ability of these insects to withstand hibernating conditions."

Southern corn shipments and their relation to corn ear worm infestations on Long Island, L. A. Carruth. (N. Y. State Expt. Sta.). (*Jour. Econ. Ent., 31 (1938), No. 2, pp. 256–259*).—Observations have shown that live corn earworm larvae are regularly borne into the New York area from States to the south, and that for a period of from 4 to 6 weeks before the first local sweet corn becomes available these larvae, infesting southern green corn, are distributed through various produce outlets within the city and in the principal outlying communities. It appears that the greater proportion of the larvae infesting such southern green corn is probably destroyed during the course of transportation, retailing, and garbage disposal, but under favorable conditions it has been possible for corn earworm moths to develop from such larvae. It may be questioned whether any significant proportion of the moths responsible for the early infestations on Long Island originates from this source.

"No relationship appeared to exist in the data available between the volume of southern green corn received at New York and the extent of the early corn earworm infestations on Long Island during the same season. Observations indicated, however, that the heavier early infestations were preceded by relatively mild local winter conditions and that the lighter early infestations were preceded by relatively severe winter conditions. Preliminary observations have established that the corn earworm can survive mild winters on Long Island, although further work is needed to determine the extent of survival after severe winter conditions. It is believed that little improvement in the Long Island corn earworm situation would result from the erection of restrictions against southern corn brought to New York markets."

Sparganothis sulfureana Clem., a cranberry pest in New Jersey, C. S. Beckwith. (N. J. Expt. Stas.). (*Jour. Econ. Ent., 31 (1938), No. 2, pp. 253–256*).—Contributing from the Cranberry Substation (E. S. R., 78, p. 510) an account is given of observations of *S. sulfureana*, its damage, seasonal history, control, and parasites. It is concluded that there is no evidence that this insect will become a general pest, since it has already been noted as being temporarily serious in two widely separated places, following which for 20 yr. no mention was made of it.

The false yellowhead, C. S. Beckwith. (N. J. Expt. Stas.). (*Amer. Cranberry Growers' Assoc., Proc. Ann. Mtg., 68 (1938), pp. 7–12, fig. 1*).—This contribution is based upon the work noted above.

Control of eye-spotted budmoth on apple by lubricating oil containing dinitro-o-cyclohexylphenol, F. Z. Hartzell, J. B. Moore, and D. E. Greenwood. (N. Y. State Expt. Sta.). (*Jour. Econ. Ent., 31 (1938), No. 2, pp. 249–253*).—Control studies of the eye-spotted budmoth by lubricating oil containing dinitro-o-cyclohexylphenol (DN-oil) the details of which are given in three tables, have led to the following conclusions:

"(1) DN-oil at 3-percent concentration, and containing lubricating oil and DN in the ratio of approximately 96: 4, is very effective in the control of the budmoth under conditions found in western New York orchards. (2) The efficiency increases, in general, with the dosage to and including 3 percent DN-oil mixtures. (3) No gain in efficiency seems to be secured by increasing the dosage above 3 percent of DN-oil. (4) In general, diluted spray emulsions of the same DN-oil content gave similar results regardless of the manner of preparation or kind of emulsion used. (5) With practically the same lubricating oil content, the effectiveness increased in proportion to the DN in the mixture. At the same time, mixtures having approximately the same DN content apparently show some increase in effectiveness with an increase of lubricating oil. (6) The two brands of lubricating oil at the same concentration and DN content gave similar results. (7) Lubricating oil at 3-percent concentration without DN was not sufficiently toxic to give commercial control of budmoth."

Control of the European pine shoot moth, R. B. Friend and G. H. Plumb. (Conn. [New Haven] Expt. Sta.). (*Jour. Econ. Ent., 31 (1938), No. 2, pp. 176–183*).—Field experiments on the control of the European pine shoot moth on red pine, the details of which are given in three tables, have shown that "spraying with a mixture of 4 lb. of ground derris root or ground cube root and 1 lb. of powdered skim milk in 100 gal. of water is superior to spraying with a mixture of 3 lb. of lead arsenate and 1 pt. of fish oil in 100 gal. of water. One application of cube about July 2 is as effective as three or four applications of lead arsenate at 10-day intervals in June and July. Two applications of cube, one July 2 and one July 12, are significantly more efficient in reducing tip injury than one application July 2. As a spreader and sticker, powdered skim milk is as efficient as any other material tried at the concentrations used. It was found that spraying during the first half of June did not give good results in controlling the insect in 1936 and 1937."

A list is given of 17 references to the literature cited.

***The use of nicotine in codling moth control, with special reference to* its effectiveness in killing moths,** W. S. Hough. (Va. Expt. Sta.). (*Jour. Econ. Ent., 31 (1938), No. 2, pp. 216–221, fig. 1*).—In experiments conducted in 1935, 1936, and 1937, the details of which are given in tables, nicotine sulfate was found to be an effective ovicide against codling moth eggs that were due to hatch within a few hours to not more than 1 day after they were sprayed. "Its effectiveness decreased rapidly in proportion to the freshness of the eggs. Fixed nicotine compounds were not effective ovicides for codling moth eggs of any age, although, as in the case of nicotine sulfate, the ovicidal effect varied directly with the age of the eggs at the time of spraying. Tests of the past three seasons show that orchard sprays containing free nicotine or nicotine sulfate can be employed to kill codling moths. The average kill as determined by the number of dead moths found on sheets that had been placed under apple trees on which moths were released was 72.5 percent. Nicotine in combination with summer oil and lead arsenate has been used effectively for three seasons in codling moth sprays designed to eradicate the first brood in May and June. No applications were made against the later broods. According to the results of 1937, the omission of lead arsenate after the first cover spray and the substitution of fixed nicotine as the larvicide in applications confined to the period of activity of the first-brood moths gave satisfactory control in a moderately infested orchard, but on the Baldwin variety in a heavily infested orchard control was not satisfactory."

Some results of codling moth control tests in 1937, B. F. Driggers. (N. J. Expt. Stas.). (*N. J. State Hort. Soc. News 19 (1938), No. 1, pp. 986*

976, 977).—The finding by Hough in Virginia, as above noted, that more than three-fourths of the adults of the first-brood codling moth in a tree can be killed by the use of 1 pt. of nicotine added to 100 gal. of lead arsenate and oil spray led to tests of the value of nicotine in a heavily infested orchard at Glassboro and one at Moorestown, N. J. The details of the work are presented in tables.

At Glassboro the injury resulting from four first-brood applications only, these including the use of bentonite-nicotine-oil (40.4 percent wormy) and lead arsenate-oil-nicotine (12.3 percent wormy), was found to be too great to warrant omission of second-brood sprays. The author is convinced, however, that the full value of the nicotine was not utilized due to the method of spraying.

In work at Moorestown the best results were obtained from the application of lead arsenate at the calyx and first cover spray, followed by three cover sprays of bentonite 4 lb., nicotine sulfate 1 pt., and milk 0.25 lb. to 100 gal., followed at 10-day intervals to complete first-brood spraying. The first second-brood spray was again bentonite-nicotine, and this was followed at 10-day intervals with two sprays of oil 3 qt. and nicotine sulfate 0.75 pt. to 100 gal. The tabulated results show that 81.9 percent were clean, 11.0 stung, and 7.1 percent wormy. Home-made oil-lead arsenate gave the next best results, with 73.9 percent clean, 21.8 percent stung, and 4.3 percent wormy. This was followed by Ortho K-lead arsenate, with 58.3 percent clean, 32.9 stung, and 8.8 percent wormy, and then Scalecide-lead arsenate, with 45.1 percent clean, 40.9 stung, and 14.0 percent wormy.

Mention is made of certain disadvantages that might be listed for the nicotine schedule. There is an increased cost of 30 ct. per tree more for the bentonite-nicotine than for the oil-lead arsenate and an element of danger in the use of tank-mixed bentonite-nicotine in that the bentonite residue persists and is difficult to remove. It is necessary when one or more tank-mixed sprays are used that two or three oil-nicotine sprays follow to loosen or mask the bentonite.

Codling moth parasitism under different spray treatments, B. F. Driggers and W. J. O'Neill. (N. J. Expt. Stas.). (*Jour. Econ. Ent., 31 (1938), No. 2, pp. 221–223*).—Data on codling moth larval parasitism obtained in a series of fixed nicotine plats, located in the center of an orchard at Glassboro, N. J., and heavily infested with codling moths, are presented, which supplement a 1936 report by Driggers and Pepper (E. S. R., 75, p. 659).

Further studies with lead arsenate substitutes for codling moth control, S. W. Harman and J. B. Moore. (N. Y. State Expt. Sta.). (*Jour. Econ. Ent., 31 (1938), No. 2, pp. 223–226*).—Further studies of codling moth control by nicotine sprays (E. S. R., 77, p. 72), the details of which are given in table form, have shown that two commercially prepared nicotine sprays, namely, Black Leaf 155 and a tank-mixed nicotine-bentonite spray, gave satisfactory control of the pest. "The Black Leaf 155, when used in three cover sprays, left a light residue that was usually negligible in amount at picking time. With five and six applications a light visible residue remained on the harvested fruit. Summer oil when combined with Black Leaf 155 was a very efficient spray and at the same time rendered the visible residue less conspicuous. The tank-mixed nicotine-bentonite spray left a heavy deposit that required cleaning. All residues from these nicotine sprays were easily removed with a brush cleaner. Nicotine sprays gave a noticeably better control when the interval between applications did not exceed 10 days than when longer periods of time were allowed between treatments. Hydrated lime incorporated in the spray preceding an application of fixed nicotine apparently had little effect on the efficiency of the nicotine treat-

ment in lightly infested orchards. Defoliation occurred on certain plats as a result of an application of sulfur following earlier treatments with summer oil. The degree of injury in each case was influenced by the variety of apple, the amount of oil that was used, and the time elapsing between the final oil treatment and the application of the sulfur."

The relation of methods of herding sheep on the open range to the prevalence of grub in the head (Oestrus ovis), S. B. DOTEN, C. E. FLEMING and L. R. VAWTER (*Nevada Sta. Rpt. 1937, p. 33*).—Project work relating to the value of methods of herding on the prevalence of the sheep botfly in Nevada range flocks is briefly reported (E. S. R., 78, p. 400).

Toxicity of hydrogenated pyrethrins I and II to the housefly, H. L. HALLER and W. N. SULLIVAN (*Jour. Econ. Ent., 31 (1938), No. 2, pp. 276, 277*).—The study here briefly reported has shown that "both pyrethrin I and pyrethrin II have good 'knockdown effect' against flies and that this effect is for the greater part destroyed when the pyrethrins are subjected to mild catalytic hydrogenation. Hydrogenation also materially reduces the mortality caused by the concentrate in which pyrethrin I predominates. The mortality caused by the concentrate in which pyrethrin II predominates was low and was not materially reduced by hydrogenation. The mortality caused by this sample was so low before hydrogenation that a marked reduction would not normally be expected. A comparison of the mortality caused by these two pyrethrin concentrates before hydrogenation indicates that the pyrethrin concentrates in which pyrethrin I predominates are more toxic to houseflies than those in which pyrethrin II predominates."

Internal treatment of animals with phenothiazine to prevent development of horn fly larvae in the manure, E. F. KNIPLING (*Jour. Econ. Ent., 31 (1938), No. 2, pp. 315, 316*).—The administration of phenothiazine to cattle at the rate of approximately 0.1 g or less per kilogram of body weight was found in three cases to prevent development of horn fly larvae in the manure that was eliminated by such animals.

Experiments on rearing apple maggot adults, R. W. DEAN. (N. Y. State Expt. Sta.). (*Jour. Econ. Ent., 31 (1938), No. 2, pp. 241–244, fig. 1*).—Studies of adults of the apple maggot, the details of which are given in four tables, indicate that, based on histological examination of the ovaries (E. S. R., 74, p. 236) the female is capable of laying from 200 to 300 eggs, a number obtained in only one experiment, although approached in some others. "In addition, there is a considerable variation in the results obtained from replications of an experiment. This suggests that present methods of rearing apple maggot adults are lacking in some factor, or factors, necessary for normal egg production which, at times, may be supplied naturally, and more readily in the insectary than under laboratory conditions. Experimental evidence as to its nature is lacking, but there are indications that it may be the effect of fluctuating temperature and humidity, exposure to high temperatures for short intervals, or the presence of micro-organisms in the food."

Japanese beetle field control tests in Delaware, H. F. DIETZ and R. I. PIERPONT (*Jour. Econ. Ent., 31 (1938), No. 2, pp. 200–204*).—The data presented indicate that ground derris and a tetramethyl thiuram disulfide mixture are at present the most effective materials as foliage protectants against the ravages of the Japanese beetle. It is pointed out that application should be made prior to any heavy invasion by this insect and that the proper adhesive should be used.

The Japanese beetle in Connecticut, W. E. BRITTON and J. P. JOHNSON (*Connecticut [New Haven] Sta. Bul. 411 (1938), pp. 453–486, figs. 17*).—A practical summary of the present status of knowledge of the life history and habi

of and control measures for this pest, presented with a list of 27 references to the literature.

Control of common white grubs in cereal and forage crops, P. Luginbill (*U. S. Dept. Agr., Farmers' Bul. 1798 (1938), pp. [2]+20, figs. 20*).—A revision of Farmers' Bulletin 940 (E. S. R., 39, p. 264), which it supersedes.

Notes on the locust leaf miner (Chalepus dorsalis Thunb.), C. B. Dominick. (Va. Expt. Sta.). (*Jour. Econ. Ent., 31 (1938), No. 2, pp. 186–189, fig. 1*).—Observations of the locust leaf miner, which has severely injured black locust trees in many parts of the State, are briefly reported. The first beetle emerged from hibernation May 5, 1937, at Blacksburg. The first eggs were deposited May 24. The incubation period ranged from 9 to 11 days, and the total life cycle ranged from 31 to 43 days in length. The insect was observed feeding on several species of trees and plants, but eggs and larvae were found only on locust leaves. Two applications of arsenate of lead applied early were found to prevent feeding and oviposition by the adults.

Feeding habits of Scolytus multistriatus Marsham with reference to the Dutch elm disease, D. L. Collins (*Jour. Econ. Ent., 31 (1938), No. 2, pp. 196–200, figs. 2*).—As a basis of comparison in the systematic study of the feeding wounds of the smaller European elm bark beetle, of which there is extreme variation in range and extent, the author suggests use of the number of crotches per branch sample. "Observations made on more than 500 trees, including the examination of more than 100,000 crotches lead to the inference that the presence of wood which is either attracting or producing beetles in or near a given tree renders that tree more favorable for feeding attacks. The exact value of spraying as a control measure against *S. multistriatus* remains in doubt, but it is increasingly indicated that the destruction of injured, dying, and dead elm wood should not only aid materially in the control of the beetles by destroying their breeding places, but also should aid in reducing the spread of the disease by rendering healthy trees less subject to feeding attacks by possibly contaminated beetles."

Two elm scolytids in relation to areas infected with the Dutch elm disease fungus, C. W. Collins (*Jour. Econ. Ent., 31 (1938), No. 2, pp. 192–195, fig. 1*).—A brief discussion of the smaller European elm bark beetle and the native elm bark beetle as vectors of the Dutch elm disease fungus *Ceratostomella ulmi*, early records and present distribution of the smaller European elm bark beetle, and distribution of the native elm bark beetle and the Dutch elm disease.

Toxicity of fumigant-CO_2 mixtures to the red flour beetle, R. M. Jones (*Jour. Econ. Ent., 31 (1938), No. 2, pp. 298–309, figs. 5*).—Data on the toxicity of methyl formate, ethylene oxide, and methyl bromide to the adults of the red flour beetle are presented. "Experiments were also conducted in which CO_2 in the proportions of 1, 5, 10, 20, 40, 60, 80, and 99.8 percent was admixed with methyl formate, ethylene oxide, and methyl bromide, and evidence is presented to show that the toxicity of these fumigants may be markedly increased by the addition of certain percentages of this gas. The results obtained indicate that the stimulative effect produced by CO_2 is considerably more pronounced with methyl formate and ethylene oxide than with methyl bromide." Data are also included which show that the maximum insecticidal effect of methyl formate, ethylene oxide, and methyl bromide is obtained with concentrations of approximately 40, 20, and 10 percent of CO_2, respectively. "The addition of CO_2 in excess of these percentages may either impart no further increase in toxicity to the mixture, or may actually decrease the effectiveness of the gaseous mixture."

The black carpet beetle (Attagenus piceus (Oliv.), E. A. Back and R. T. Cotton (*Jour. Econ. Ent., 31 (1938), No. 2, pp. 280–286*).—This contribution dealing with the economic history and biology of the black carpet beetle, includes tables giving the number of eggs deposited by groups of five adults in Washington, D. C., and the development of larvae that hatched about June 1. It is pointed out that this pest has been saddled with a common name that conveys little idea of its wide range of foods of a farinaceous nature or of its prime importance as a pest of dwellings and educational and industrial establishments. At present it is easily the most destructive and widespread of the so-called carpet beetles or buffalo moths.

A list of 23 references to the literature cited is included.

Flooding for the control of wireworms in California, R. E. Campbell and M. W. Stone (*Jour. Econ. Ent., 31 (1938), No. 2, pp. 286–291*).—Experiments in flooding the soil for the control of wireworms (principally the sugar beet wireworm) conducted in California in 1929 and 1930 and 1933 and 1934 are reported as performed under cage conditions and in field plats. It is concluded that the mortality of wireworms from flooding depends largely on the temperature of the soil. Flooding, even for long periods, is relatively ineffective unless the soil temperature is 70° F. or above. Under these favorable conditions, 80 to 90 percent of the wireworms are killed, the mortality increasing and the length of time required decreasing with rise in temperaure. The majority of wireworms surviving the flooding operation are at a depth of 9 in. or more in the soil. Mortality is increased to a slight extent by plowing before flooding. Continuous flooding is more effective than intermittent flooding. About 4 acre-in. of water per day is required.

Biology of the pea weevil in the Pacific Northwest, with suggestions for its control on seed peas, A. O. Larson, T. A. Brindley, and F. G. Hinman (*U. S. Dept. Agr., Tech. Bul. 599 (1938), pp. 48, figs. 24*).—Following a brief introductory account and descriptions of the life stages of the pea weevil, its life history and habits, effect on the pea seed, factors affecting its abundance, natural enemies, and control experiments, based upon work in the Pacific Northwest, are dealt with.

The weevils emerge from hibernation when the air temperatures in the spring exceed approximately 70° F. They are attracted to the pea fields when the peas begin to bloom, the ingestion of pollen being necessary for the production of eggs. Egg laying commences in from 4 to 14 days after feeding. "A maximum of 749 eggs was recorded from a single female, deposited during a period of 113 days. A study of pea weevil oviposition in the field revealed that this insect is able to lay eggs throughout the entire period in which peas can be grown, although the rate of egg deposition decreases late in the summer. No eggs were laid when the air temperature was below 65°. Individual plantings of peas were suitable for egg laying during a period ranging from 8 to 30 days, depending on the time the peas were planted. At Moscow, Idaho, the time required for the eggs to hatch ranged from 5 to 14 days, averaging 9 days. At Corvallis, Oreg., this period ranged from 6 to 23 days, averaging 10 days. The average duration of the larval stage at Moscow ranged from 32 to 43 days in the different series of peas examined, with a maximum of 56 days in any series and a minimum of 25. At Corvallis, in 1933, the duration of the larval stage ranged from 27 to 48 days, averaging between 37 and 38. The pupal stage ranged from 8 to 27 days at Moscow, averaging 15 days in 1932 and 11.5 days in 1933. At Corvallis, in 1933, the pupal stage ranged from 8 to 12 days, averaging 10 days. A summary of the data on 548 individuals revealed that at Moscow the insect developed from egg to adult in

an average of 66 days in 1932. In 1933 the average length of this developmental period for 231 individuals was 55 days. The maximum period required for total development was 82 days and the minimum period 45. Records for 149 individuals at Corvallis in 1933 showed the average time required for development from egg to adult to be 57 days, while the maximum was 71 days and the minimum was 46. The development of a partial second generation was indicated by a sudden increase in the abundance of eggs laid late in the summer and by the fact that weevils that developed during the summer laid fertile eggs in the laboratory the same season. . . .

"Two chalcid parasites, *Microdontomerus anthonomi* and *Eupteromalus leguminis*, were found attacking the pea weevil. Parasites and predators appear to be of little importance in the natural control of this pest. Fumigation with carbon disulfide, hydrocyanic acid gas, or chloropicrin is used to kill the weevils in harvested peas. Burning harvest debris on the surface of the field has proved to be an effective method of killing the weevils in shattered peas where there is sufficient straw and other plant material remaining on the field to maintain a fire. However, since burning is contrary to good soil conservation practices, it is not recommended except as a last resort. Cage experiments and field tests showed that from 0.9 to 3.6 percent of the weevils in infested peas were able to reach the soil surface when buried to a depth of 8 in. in a manner simulating the methods ordinarily employed in plowing. Pasturing harvested pea fields with livestock proved to be an unsatisfactory method of controlling the weevil in shattered peas. Usually the animals consumed only a small percentage of the peas."

The bean weevil and the southern cowpea weevil in California, A. O. LARSON and C. K. FISHER (*U. S. Dept. Agr., Tech. Bul. 593 (1938), pp. 71, figs. 28*).—Report is made of life history and bionomic studies commenced by the senior author in 1919 and conducted principally in California, the details being given in 11 tables and 1 graph.

In the field the eggs of the bean weevil are safely hidden from view inside of the pod. In stored beans the eggs are laid in clusters loosely among the beans or under the partly loosened seed coat of some of the beans, whereas the cowpea weevil fastens its eggs securely to the seeds. As many as 209 eggs have been recorded from one female bean weevil and a maximum of 196 eggs from one female cowpea weevil. The oviposition period for the bean weevil ranges from a minimum of 5 days in summer to a maximum of 39 days in winter. The authors have recorded incubation periods ranging from 3 days in August to 27 days in December and January. The first-instar larva is provided with a prothoracid plate which aids it in making its entrance into the seed. The young larva of the bean weevil, among stored beans, braces against an adjacent bean or the wall of the container while it bores into another bean. The young larva of the cowpea weevil uses the upper part of the eggshell to brace against while it bores through the pod and into the seed or directly into the seed. When within the bean the walls of the larval burrow support the larva of either species while it gnaws, the larva making a larger cell as it grows. Four larval skins are molted between the egg and the pupal stages. The adult, before emerging, cuts a groove in the seed coat around the edge of the cell and pushes the seed coat out. The authors have found six generations of the bean weevil to be the rule in California, with occasionally only five. The cowpea weevil has six generations and sometimes seven in California. If not checked by control measures the weevils become abundant in June, and the large populations continue during warm weather as long as there is a sufficient food supply. Field infestations result ordinarily from weevils from infested stored beans rather than from planted weevily beans.

Often serious field infestations result from small left-over lots of seed. Control in the field is accomplished by eliminating all lots of beans or cowpeas held over after planting time, and by burning the old vines or feeding them to livestock or turning them under; in the warehouse, by fumigation and by keeping the premises clean.

A list of 98 references to the literature is included.

The relative efficiency of certain fluorine and arsenic insecticides against the cowpea curculio, F. S. ARANT (*Jour. Econ. Ent., 31 (1938), No. 2, pp. 309–313, figs. 2*).—A method of testing the efficiency of insecticides against the cowpea curculio which proved suitable consisted of confining the insect from 6 to 8 hr. in a Petri dish containing a film of the powdered insecticide, then transferring the insect to food, and making regular observations to determine the percentage of kill. Large numbers of the beetles were used, and tests of the various insecticides were conducted simultaneously. This method was decidedly more satisfactory than several others tried. The percentages of net mortality at the end of the limited-exposure experiment were as follows: Calcium arsenate 93.8 percent, sodium fluosilicate 91.2, barium fluosilicate 90.9, magnesium arsenate 69.7, acid lead arsenate 48.9, and cryolite 14.6 percent. Talc was an efficient diluent with three types of insecticides, namely, sodium fluosilicate, derris, and calcium arsenate. Preliminary experiments proved derris, pyrethrum, and 4-aminodiphenyl to be relatively ineffective.

The carrot weevil (Listronotus latiusculus (Boh.)), a new pest on celery, B. B. PEPPER and L. E. HAGMANN. (N. J. Expt. Stas.). (*Jour. Econ. Ent., 31 (1938), No. 2, pp. 262–266, fig. 1*).—An account of the history of the carrot weevil, its distribution in the United States and on celery in New Jersey, food plants, injury and losses, life history and habits, and control. The results of insecticide experiments in 1936 and 1937, from which no conclusions are drawn, are briefly considered, the details being given in two tables.

Studies on the control of the orchid weevil, C. C. HAMILTON. (N. J. Expt. Stas.). (*Jour. Econ. Ent., 31 (1938), No. 2, pp. 189–192*).—Control work with *Diorymerellus laevimargo* Champ., a preliminary account of which by the author has been noted (E. S. R., 71, p. 228), is reported, the details being given in three tables. In laboratory tests, derris powder was considerably less effective than pyrethrum powder and Dry Pyrocide, but these gave an excellent kill of the weevils in laboratory tests conducted as applications would be made in the greenhouse. It is pointed out that the use of either of the two is not expensive, is easy and less objectionable to apply than the paradichlorobenzene treatment, and would seem to have no possibilities of injury to the plants or the peat.

Influence of feeding habits of Tiphia vernalis on the parasitization of the Japanese beetle, T. R. GARDNER (*Jour. Econ. Ent., 31 (1938), No. 2, pp. 204–207*).—It is pointed out that, while the surveys reported upon in this contribution, the details of which are given in three tables, are limited and by no means conclusive, they indicate that the feeding habits of *T. vernalis* Roh. adults are important factors in the spread and efficiency of this parasite of the Japanese beetle. "When the distribution of honeydew is limited or concentrated, the *Tiphia* are attracted from the surrounding area and congregate on the infested trees and shrubs for their food supply. When this occurs, the spread and efficiency of the parasite is lowered through its lack of dispersion, and superparasitization results, especially in those areas where the host population is of insufficient density to accommodate the parasite. Colonies liberated in areas where the adult food supply is entirely absent or where it is very limited rarely become established. It has been found that Japanese beetles disperse very readily and deposit their eggs over a wide area, but the grubs are usually more abundant near the

trees and shrubs on which the adults feed. This condition is favorable for the parasite and tends to increase its efficiency by lessening superparasitization, especially in those areas where the *Tiphia* are attracted to the same trees and shrubs for their food supply."

ANIMAL PRODUCTION

[Investigations with livestock in Arizona] (*Arizona Sta. Rpt. 1937, pp. 34–38, 65, 91, 92*).—Studies for which results are briefly presented include the value of supplemental range feeding, the vitamin A content of blue grama grass, mother-sugar-beet silage v. hegari silage for cattle, the relation of type and conformation to the economy of gain and killing qualities of range steers, and the relation between birth weight and subsequent rate of gain in beef calves.

Poultry investigations gave information on the effect of backcrossing and reciprocal crosses on egg production in the offspring, and the utilization of locally grown grains in poultry rations.

[Experiments with livestock by the Florida Station], R. B. Becker, W. M. Neal, P. T. D. Arnold, L. L. Rusoff, A. L. Shealy, W. W. Henley, W. G. Kirk, R. M. Crown, C. H. Willoughby, O W. Anderson, Jr., N. R. Mehrhof, R. W. Kidder, L. O. Gratz, W. F. Ward, and M. W. Emmel (*Florida Sta. Rpt. 1937, pp. 53–55, 56, 57, 58, 59, 60, 61, 62, 157, 158, 162–165, 167, 168, 179, 180, 181, 182, 183, figs. 3*).—Results are briefly presented on the use of purebred sires on native cows for grading up beef herds and other beef and dual-purpose cattle investigations; mineral deficiencies in feeds used in cattle rations; the ensilability of Florida forage crops; the efficiency of the "stack" silo for the preservation of sugarcane and forage crops; the feeding value of sorghum silage, peanut hay, and cottonseed hulls as roughages in fattening steers; the digestible coefficients and feeding value of citrus cannery refuse for cattle; utilization of citrus byproducts for swine; the deficiencies of peanuts as a feed for swine; a comparison of various grazing crops for fattening feeder pigs; and the performance of grade Hampshires and Columbia sheep.

Poultry tests gave information on the use of peanuts and peanut products in turkey production; confinement v. range rearing of chicks and the effects of these methods on mortality and egg production of pullets; the importance of range rotation in poultry production; and a comparison of sources of proteins for fryers and broilers.

[Experiments with livestock in Hawaii] (*Hawaii Sta. Rpt. 1937, pp. 66–82, 84, 85, figs. 3*).—Results are briefly presented on the value of koa haole (*Leucaena glauca*) alone and supplemented with cane molasses and of grass v. pigeonpea pastures, each alone and supplemented with cane molasses and protein concentrate for fattening beef cattle, by L. A. Henke, S. H. Work, and A. W. Burt; the value of a home-produced ration of sweetpotatoes, cane molasses, pineapple bran, and fish meal for fattening swine, a comparison of barley, pineapple bran, and algaroba bean meal as the major components in swine fattening rations, and the composition and digestibility of green napier, Rhodes, and *Panicum* grass, green alfalfa, koa haole (*Leucaena glauca*) and pigeonpea tops, algaroba bean meal, and sifted cane bagasse, all by Work; reports of poultry tests, including a comparison of fresh alfalfa and fresh tree kale in poultry rations, a comparison of poi, taro, and taro waste in fattening rations, the efficiency of battery cages for laying and breeding stock, and the value of artificial illumination for laying hens, all by C. M. Bice; and the use of cane molasses in the fattening and laying rations, and cross-breeding for meat and egg production, both by Bice and B. A. Tower.

[Experiments with livestock in Iowa] (*Iowa Sta. Rpt. 1937, pts. 1, pp. 80–84, 85, 86, 87, 88, 89–94, 96–103, 104–108, figs. 4; 2, pp. 69–72*).—Brief progress results (E. S. R., 77, p. 227) are reported in part 1 on the following swine investigations under the leadership of J. L. Lush, C. C. Culbertson, M. D. Helser, F. J. Beard, and B. H. Thomas: The consequences of inbreeding Poland China hogs, the value of the Danish Landrace breed in the development of improved strains of swine for American conditions, the evaluation of swine breeding stock by performance records of the offspring, the value of yeast and yeast feeds in supplementing grain for pigs on rape pasture, the relative efficiency of different sources of calcium for growing and fattening spring pigs in dry lot, and the influence of different amounts of soybeans and their products upon the quality of pork and the character and keeping qualities of lard.

Other livestock studies for which results are reported include the comparative amount and kind of inbreeding and other breeding practices which have been used in producing the pure breeds of livestock, by Lush; the value of certain protein supplements and a simple mineral mixture for fattening calves, by Culbertson; factors involved in the production of colts, by A. B. Caine; the production of derivatives of sterols and their role in animal nutrition, by L. Yoder and Thomas; and the development and cure of nutritional anemia in lambs, by Thomas.

Poultry investigations under the leadership of H. L. Wilcke, E. W. Henderson, N. F. Waters, E. W. Lindstrom, J. W. Gowen, T. T. Milby, C. D. Lee, B. Lowe, and Thomas include the effects of inbreeding and crossbreeding in the domestic fowl, the effect of diet on the quantity of vitamins A and D occurring in hens' eggs, the biological value of different levels of meat scraps and milk combinations for egg production and the influence of rations and management on egg quality and egg size, a comparison of avian growth rates, the effects of the levels and sources of protein and inorganic elements in the ration upon slipped tendons in chicks and poults, the biological efficiency of several protein fractions for numbers, size, and quality of eggs produced by hens, the tolerance of poultry for fat in their rations, the comparative efficiency of some protein supplements for growth and nitrogen retention of chicks, and factors in oats which affect growth and feathering in domestic fowl.

In part 2, results are briefly noted on the relative efficiency of different types of corn for growing and fattening pigs, by C. C. Culbertson and J. L. Robinson; and a comparison of protein supplements for finishing steer calves in dry lot, by Culbertson, P. S. Shearer, M. D. Helser, F. J. Beard, and B. H. Thomas.

[Livestock investigations in Kentucky] (*Kentucky Sta. Rpt. 1937, pt. 1, pp. 16–19, 41, 42*).—Results are briefly presented on the value of distillers' slop for hogs; alfalfa, oats and rape, and bluegrass as pastures for swine; the occurrence of fluorine in livestock mineral mixtures; the function of manganese in prevention of slipped tendon in chicks; an abnormality of the chick embryo produced by manganese deficiency in the diet of the hen; the value of Korean lespedeza, *Lespedeza sericea*, and alfalfa leaf meals in poultry rations; the influence of corn on the production and composition of chicken fat; the use of dried bluegrass in an all-mash poultry ration; the use of a high protein concentrate as a sole diet for chicks; and all-mash feeding v. separate feeding of grain and meat scraps to pullets.

[Livestock investigations in Massachusetts] (*Massachusetts Sta. Bul. 347 (1938), pp. 20, 23, 24, 39, 88–90*).—Brief results are reported on nutritional anemia in cattle in southeastern Massachusetts and the iron content of hay grown on soils producing this condition, by J. G. Archibald, K. J. Kucinski, and W. S. Eisenmenger; the palatability of pasture grass in relation to its composi-

tion, by Archibald; the vitamin A content of certain grasses, by W. S. Ritchie and Archibald; and the bacteriostatic effect of lignin in the rat diet, by E. Bennett. From poultry tests results are noted on broodiness in poultry, breeding for low mortality, a genetic study of Rhode Island Red color, relation of plumage color to sex, rate of feathering in Rhode Island Reds, and time of emergence of chicks from the shell as a factor in poultry breeding, all by F. A. Hays; and breeding for egg production, by Hays and R. Sanborn.

[Investigations with livestock in Nebraska] (*Nebraska Sta. Rpt. [1937], pp. 11, 39–46, 47–51, 56, 57, 59, 60, 61*).—Included are brief reports on molasses v. corn for fattening yearling heifers; wintering heifer calves on silage with varying amounts of cane molasses, cottonseed cake, and cracked corn; molasses as a supplement to corn, tankage, and alfalfa meal for fattening hogs; the value of yeast feeds for fattening pigs in dry lot; a comparison of shelled corn, hominy feed, ground oats, and cane molasses for growing and fattening pigs on Sudan grass; the extensive use of skim milk in pig-growing rations; substituting cane molasses for corn in silage-and-alfalfa-hay lamb-fattening rations; and the transmission of a short-tailed character in Hampshire sheep. At the North Platte Substation tests were conducted on feeding steers on native pastures; a comparison of rations for weaned calves; and winter rations for breeding cattle. At the Scottsbluff Substation comparison was made of various lamb-fattening rations, and at the Valentine Substation study was made on the value of protein concentrates as supplements to prairie hay for wintering range calves.

Poultry investigations reported include the comparative efficiencies of various proteins; soybean oil meal in rations for broilers; ground soybeans and corn-milling byproducts in the chick ration; comparison of soybean meal and dried buttermilk for poults; dolomitic and high-calcium limestones in the poultry ration; chicken scraps v. meat scraps or mixed protein supplements in the chick rations; and, from the Valentine Substation, genetic differences existing in turkey flocks.

[Livestock investigations in Nevada] (*Nevada Sta. Rpt. 1937, pp. 24–26, 27, 28, 36, 37, fig. 1*).—Included are brief progress reports (E. S. R., 78, p. 376) on feeding barley with alfalfa to range ewes and lambs, by C. E. Fleming; development of a rotation paddock system of grazing on irrigated meadows by range flocks or sheep, by Fleming and C. A. Brennen; and the efficiency of gains by pigs of various initial weights, and the protein and mineral requirements of turkeys, both by F. B. Headley.

[Investigations with livestock in New Hampshire], E. G. Ritzman, A. E. Tepper, R. C. Durgin, T. B. Charles, P. A. Wilcox, and D. W. Flagg (*New Hampshire Sta. Bul. 304 (1938), pp. 26–29, 33–35*).—Studies on which progress results are reported include the effect of environmental temperature and certain other factors on the metabolism of cattle, sheep, goats, and swine; the selection and breeding of sheep for four functional nipples; the protein and vitamin A requirements of chickens; the value of individual cages for poultry nutrition studies; confinement v. open range for Bronze turkey breeders; range shelter v. continued use of the colony brooder house in rearing chicks; and the efficiency of gas-burning brooders.

[Experiments with livestock in South Dakota], J. W. Wilson, B. Aune, A. L. Moxon, and W. E. Poley (*South Dakota Sta. Rpt. 1937, pp. 10–14, 16, 31–33*).—Results are briefly presented on a comparison of Sudan grass, Amber cane, native wheatgrass, and alfalfa hays, and the value of molasses and pressed beet pulp as supplements to corn, cottonseed cake, and alfalfa in lamb feeding; the development of no-tailed breed of sheep; and the value of medium and lightweight barleys for summer pigs. Poultry investigations gave information

on the effect of common grain varieties on egg quality and poultry; a comparison of high and lower grades of corn, wheat, and barley in poultry rations; the value of oats and millet in laying rations; the effect of seleniferous grains on the growing chick; a comparison of grains in turkey-growing rations; factors affecting hatchability of turkey eggs; and capon production in South Dakota.

Legume and grass silages, O. M. Camburn, H. B. Ellenberger, J. A. Newlander, and C. H. Jones (*Vermont Sta. Bul. 434 (1938), pp. 18–23, figs. 3*).—In the trials reported 28 experimental silages were prepared (12 alfalfa, 12 timothy, and 4 soybean). Alfalfa and timothy were cut at two stages of maturity, and each crop was ensiled immediately after cutting and after wilting in the swath. Each lot was ensiled without preservative and with molasses. The general condition of the silages, including pH, color, odor, and palatability, and the analyses of the fresh and ensiled materials are indicated.

Within a dry matter range of 30–40 percent all crops were successfully ensiled either with or without molasses. Dry matter contents below 30 percent favored putrefactive fermentation, especially when no molasses was added, while dry matter above 40 percent tended to prevent tight packing and induced heating and spoilage. The addition of 2 percent molasses to timothy and 3 or 4 percent to alfalfa and soybeans is recommended as a means of improving the odor and palatability and enhancing the preservation of nutrients. Close packing and exclusion of air proved essential to proper preservation.

A summary of a survey of methods and results of using legume and grass silage on Northeastern farms is reproduced (E. S. R., 79, p. 373).

Commercial feeding stuffs, H. R. Kraybill et al. (*Indiana Sta. Circ. 236 (1938), pp. 36, fig. 1*).—This condensed report of the commercial feed inspection for 1937 (E. S. R., 77, p. 829) covers 3,380 feed samples examined. The average analysis and range of analysis are given for 116 samples of canned dog food examined.

Methods of preparing the corn crop for yearling steers, G. A. Branaman, G. A. Brown, and R. S. Hudson (*Michigan Sta. Spec. Bul. 293 (1938), pp. 16, figs. 6*).—The results are summarized for three feeding trials with yearling steers grading "good." Silage from well-eared corn proved superior to either shock corn or ground shock corn. An acre as silage produced 50 percent more beef and pork than an acre of shock corn in the bundle, and returned 58 percent more cash above expenses of harvesting and handling. Grinding shock corn proved a more expensive method of handling the crop than the silo. Grinding slightly increased the amount of meat produced per acre over the bundle corn, but the increase was not sufficient to pay the added cost of grinding. Steers fed ground fodder carried less finish, graded lower, and had lower dressing percentage than the group fed shock corn. Feeding shock corn required the least man and horse labor and the lowest power and machinery costs of the three methods.

A comparison of sorghum silage, peanut hay, and cottonseed hulls as roughages for fattening steers, A. L. Shealy and L. O. Gratz (*Florida Sta. Bul. 320 (1938), pp. 10*).—Feeding trials of from 120 to 148 days' duration were conducted during 3 successive years, using 10 steers per lot in each trial. In addition to the roughages under comparison, a uniform grain mixture of broken ear corn, velvetbeans in the pod, and cottonseed meal was fed.

The average daily gain per steer was quite similar on the different roughages, a 3-yr. average of 1.81, 1.79, and 1.96 lb. obtaining for the sorghum silage, peanut hay, and cottonseed hulls groups, respectively. The cottonseed hulls group showed a slightly higher dressing percentage in each trial.

Valuing sorghum silage at $3.50 per ton and the grain mixture at $20, the peanut hay and cottonseed hulls were worth $12.50 and $9.73 per ton, respectively.

An additional lot of steers in the second and third trials which permitted a comparison of cottonseed meal and peanut meal in the grain mixture with sorghum silage as a roughage showed these feeds to be practically identical in supplementary value.

Fattening shorn and unshorn Merino lambs, T. B. Keith and W. L. Henning (*Pennsylvania Sta. Bul. 357 (1938), pp. [1]+16, figs. 2*).—Three trials comparing the rate and economy of gains of shorn and unshorn native fine wool lambs fed during the late winter and early spring are reported. Each trial included four groups, giving a comparison of early shorn and late shorn lambs with the unshorn group.

In the first trial (1933) the shorn group averaged about 15 percent greater gains than the unshorn lot, while in the two latter trials (1934 and 1937) gains were approximately the same in all groups.

The average feed consumption of the shorn lambs ranged from 0.9 to 3.6 percent greater than for the unshorn ones. A higher percentage of early shorn and unshorn lambs graded tops on the market and yielded choice carcasses than did the late shorn ones. The late shorn lambs had the lowest percentage of shrinkage during transportation.

The fleeces of lambs shorn in February, March, April, and May averaged 7.3, 7.7, 8.1, and 8.3 lb. in weight, respectively. With average weather conditions and average prices shorn lambs gave higher net returns than the unshorn ones.

A study of the group-structure of Merino fleeces, J. C. Swart and J. J. J. Kotzé (*Empire Jour. Expt. Agr., 5 (1937), No. 20, pp. 307–317, pl. 1*).—Data are presented on the size, average fiber diameter, average fiber length, average number of crimps, and type of crimp for a large number of strands taken from 2 × 2 cm wool samples from the belly, shoulder, side, and britch of Merino sheep. These strands, which apparently are formed by a grouping of fibers growing from one or more follicle groups, showed considerable variability with regard to all of the above factors. Overcrimpiness of wool was ascribed to an inherent characteristic developing in the absence of certain limiting factors such as density of fleece and large size of strands. In addition to crimpiness wool strands probably also have an inherent spiral tendency. Wateriness of wool is apparently due to other faults in the fleece, and its development is dependent on inherent features of a deep crimp and spiral tendency in connection with a considerable lack of fleece density. A liberal supply of yolk proved an effective protective covering for the tips of the fibers.

Studies on Mongolian sheep wool, I, II, M. Saito (*Inst. Sci. Res. Manchukuo, Rpt., 1 (1936), Nos. 2, pp. 29–62, figs. 33, Eng. abs., pp. 11–14; 11 (1937), pp. 397–420, pl. 1, Eng. abs., pp. 61–65, figs. 2*).—Two papers are presented from the Institute of Scientific Research of Manchukuo.

I. *Some macroscopical, microscopical, and chemical investigations on Mongolian sheep wool.*—The structural and chemical differences between Mongolian sheep wool and Merino wool were studied. The Mongolian wool contained on the average 22.2 percent of coarse, 8.6 of semicoarse, and 69.2 percent of fine wool. The ordinary coarse, semicoarse, and fine Mongolian and medium-type Merino wools averaged 60μ–70μ, 40μ–45μ, 23μ–28μ, and 16μ–20μ in diameter and 1,211, 1,453, 1,715, and 2,422 serrations of wool per inch, respectively. Data and microphotographs on the surface structure, cross section, and longitudinal section of samples are presented. The crude fat; total nitrogen;

diamino-acid, arginine, cystine, and *tyrosine nitrogens;* and sulfur decreased, while carbon increased as the coarseness of the wool increased.

II. *Some physical properties (tensile strength, elongation, and Young's modulus)* of Mongolian sheep wool.—Fine Mongolian wool (average diameter 25.6μ) and a thick type of Merino wool of similar diameter were used in these studies. A special testing machine for measuring tensile strength and elongation of single fibers is described. Data on the strength and elasticity of both fat-free and grease-wool samples are presented. The Mongolian wool showed 6–10 percent greater breaking stress, 7–15 greater tensile strength, 6–11 lower percentage-elongation, 5–7 greater elastic limit per unit area of cross section, and 25–36 percent greater Young's modulus than Merino wool. The above average differences applied to both fat-free and greasy fibers, although all factors were higher in the fat-free samples.

The milk consumption and growth of suckling pigs, H. P. DONALD (*Empire Jour. Expt. Agr., 5 (1937), No. 20, pp. 349–360, figs. 3*).—In an experiment at the Institute of Animal Genetics, University of Edinburgh, pigs in the litters of two Large White sows were weighed individually before and after each suckling for 1 week. The total milk yield for the week was 29.6 kg in the case of a gilt suckling 12 pigs and 38.4 kg for the older sow suckling 10 pigs. Average yields per suckling at 2-hr. intervals were about 375 and 500 g for the gilt and sow, respectively, while maximum yields (following intervals of over 4 hr.) were 635 and 691 g, respectively. The production of individual nipples showed great irregularity, the anterior nipples tending to be more productive than the posterior ones. In general, the largest pigs obtained the most milk, but pigs receiving the largest amount of milk in excess of their maintenance requirement converted it into live weight less efficiently than their litter mates.

Suckling and suckling preference in pigs, H. P. DONALD (*Empire Jour. Expt. Agr., 5 (1937), No. 20, pp. 361–368*).—In connection with the above study, information was obtained regarding the suckling habits of pigs. Apparently strong preference existed among the members of the litter with reference to suckling particular nipples. The number of pigs in the litter, the suckling behavior of the sow, and the degree of uniformity of the udder, all affect the distribution during suckling. After a brief preliminary period of suckling, milk was liberated from the udder very rapidly, the second or main period of suckling generally lasting less than 1 min. The process of suckling could be well accounted for by the "erection theory."

Effect of percentage of protein in the diet on growth and feed utilization of male chickens, J. C. HAMMOND, W. A. HENDRICKS, and H. W. TITUS. (U. S. D. A.). (*Jour. Agr. Res. [U. S.], 56 (1938), No. 11, pp. 791–810, figs. 5*).—The experiment involved 14 pens of cross-bred males (Rhode Island Red males × Barred Plymouth Rock females). For 52 weeks diets ranging in protein content from 13 to 25 percent, by increments of 2 percent, were fed to 7 pens ad libitum and to 7 pens at 70 percent of an idealized intake for this cross. The relationship of average live weights to age, feed consumption, and protein consumption was determined.

During the first 14 weeks the average live weights were in the order of the quantity of protein consumed, while beyond the fourteenth week the advantages obtained on the higher protein levels were maintained but no further advantages were obtained. All lots fed ad libitum reached approximately the same weight by the fortieth week and all in the limited-fed group by the fifty-second week. On the basis of feed consumed, birds fed the 21 and 25 percent protein levels made the most efficient gains in the ad libitum- and

limited-fed groups, respectively. The more protein a lot consumed the sooner the birds attained full body size, and the more protein consumed per week the greater was the gain per week until the inflection point on the growth curve was reached. After maximum live weight was reached, 13 percent of protein proved adequate for the maintenance of the birds.

The utilization of food elements by growing chicks.—V, A comparison of cottonseed meal and linseed oil meal as portions of the protein concentrate, C. W. ACKERSON, M. J. BLISH, and F. E. MUSSEHL (*Nebraska Sta. Res. Bul. 100 (1938), pp. 8*).—Continuing this series of investigations (E. S. R., 79, p. 92), the effectiveness of an all-mash ration containing 5 percent each of meat scraps, fish meal, and linseed oil meal was compared in growth and body analysis experiments with young chicks with one of similar composition except that 4.5 percent cottonseed meal and 0.5 percent starch were substituted for the linseed oil meal.

The rate of gain of chicks and the retentions of calcium and phosphorus were slightly lower on the linseed oil meal ration than on the cottonseed meal mixture. Neither of these feeds proved as efficient in supplementing meat scraps and fish meal as did soybean oil meal or dried buttermilk used in earlier trials in this series. Lots fed cottonseed meal and linseed oil meal retained 38 and 36 percent of the nitrogen fed, respectively, which is somewhat lower than nitrogen retention on a comparable ration containing 5 percent soybean oil meal.

The effect of fattening at different ages on the composition of the cockerels, H. M. HARSHAW (*Poultry Sci., 17 (1938), No. 2, pp. 163–169*).—Employing the same analytical methods as in the previous experiment (E. S. R., 76, p. 377), data are presented on the physical and chemical composition of cross-bred cockerels which were reared under normal conditions on range, at ages of 8, 12, 16, and 20 weeks, and of similar aged groups of cockerels reared under the same conditions and subjected to an additional 2-week period of intensive fattening.

The percentage of breast muscle and leg muscle decreased with fattening, while the percentage of the remaining edible portion increased. The ratio of leg muscle to dressed weight increased with age, while the breast muscle and dressed weight ratio remained practically constant. The ratio of the remaining edible portion to dressed weight was largely dependent on the extent of fattening. The ratio of gain in leg and breast muscle to total edible gain decreased with age. The percentage of protein, ash, and water decreased in the leg muscle and in the remaining edible portion with fattening, but not in the breast muscle. Fat increased in all edible portions during fattening, but the greatest quantity was stored in the remaining edible portion. Fat plus water represented from 85 to 92 percent of the gain in total edible portion, and the percentage of gain represented by fat increased with age.

The effect of certain fish meals and fish oils in the ration on the flavor of the turkey, V. S. ASMUNDSON, T. H. JUKES, H. M. FYLER, and M. L. MAXWELL. (Calif. Expt. Sta.). (*Poultry Sci., 17 (1938), No. 2, pp. 147–151*).—Flavor scores are reported for 48 turkeys reared to 16 weeks of age on all-mash rations containing limited amounts of fish meal and then fed for an additional 6 weeks or more on one of the several experimental rations described. These included 25 percent of sardine and tuna fish meal rations with and without sardine- or cod-liver oil, both high grade and inferior fish meals being fed. In addition the birds were handled in different ways immediately before and after killing. All carcasses were roasted under standard conditions without stuffing and scored by a number of judges working independently.

Feeding rations containing 25 percent of high grade fish meals did not produce off-flavors when slaughtered birds were held at low temperature until drawn and cooked. When birds were not starved prior to killing and were held in a warm room from 12 to 24 hr. after killing, the flavor was generally adversely affected, more pronounced off-flavors resulting from the low grade than from the high grade fish meals. Birds receiving 2 or 5 percent of the fish oils were usually judged as having off-flavor and odor. Feeding fish oil in addition to fish meal increased the iodine number of the fat, but iodine number apparently did not vary directly with the flavor of the flesh.

The effect of hempseed preparations and of fineness of diet on the chick gizzard lining, H. J. ALMQUIST (*Poultry Sci., 17 (1938), No. 2, pp. 155–158, fig. 1*).—The previous observations (E. S. R., 78, p. 386) on the remarkable action of hempseed meal on chicken gizzard linings led to further study. In agreement with former results a hexane extract of hempseed meal showed appreciable antigizzard erosion activity, while a similar activity remained in the hempseed meal, partially in a form which was difficult to extract. In the second study grit or gritlike substances exerted a diminishing effect on the severity of gizzard erosion, but the fineness or coarseness of the diet had no effect on the condition of the gizzard lining. These results are somewhat at variance with those reported by Wisconsin workers (E. S. R., 78, p. 89).

Sulphur and rickets, C. E. HOLMES, H. J. DEOBALD, and C. A. HERRICK (*Poultry Sci., 17 (1938), No. 2, pp. 136–142*).—Chicks having access to sunlight showed no evidence of rickets or other ill effects when fed rations containing 5 percent of flowers of sulfur. Chicks confined in the absence of sunlight receiving 2, 5, or 10 percent of granular sulfur with either 0.5 or 1 percent of cod-liver oil, 2 percent of wettable sulfur with 0.5 percent of cod-liver oil, and from 2 to 5 percent of flowers of sulfur with 1 percent of cod-liver oil, all developed "sulfur rickets." Feeding 5 percent of either flowers of sulfur or granular sulfur with 2 percent of cod-liver oil gave approximately normal levels of bone ash, but the retardation of growth was equally as great as when 0.5 or 1 percent of cod-liver oil was fed. Irradiation with a quartz mercury vapor lamp for 15 min. daily gave normal bone ash levels when up to 5 percent of flowers of sulfur were fed, but growth was subnormal. Apparently the continued feeding of 2 percent or more of any of the above forms of sulfur is likely to result in rickets when chicks are dependent on cod-liver oil as their source of vitamin D.

The effect of different mash levels of alfalfa leaf meal in enhancing hatchability (*Rhode Island Sta. Rpt. [1937], pp. 38, 39*).—The results are presented on the egg production, hatchability, average feed consumption, and yolk color resulting from the use of from 5 to 20 percent of alfalfa leaf meal in the laying mash.

The formation of the chalazae and inner thin white in the hen's egg, R. M. CONRAD and R. E. PHILLIPS. (Kans. Expt. Sta.). (*Poultry Sci., 17 (1938), No. 2, pp. 143–146, fig. 1*).—This comparison of the physical and chemical properties of eggs in various stages of formation gave evidence that the layer of gelatinous white adjacent to the yolk becomes partially liquefied before the egg reaches the uterus, involving a change in the colloidal structure of the mucin but no decrease in the amount of this constituent. By use of an artificial uterus, in which the white could be rotated around the yolk at the rate of about 10 revolutions per hour, normal appearing chalazas were consistently produced. Apparently the mucin in the partially liquefied gel was segregated to form the chalazas and chalaziferous layer around the yolk, leaving a much more fluid inner thin white. This process is not brought about by chemical agents alone but evidently depends on the rotation of the egg in the uterus.

Factors influencing the percentage of thick albumen of hens' eggs, C. W. Knox and A. B. Godfrey (*Poultry Sci.*, *17* (*1938*), *No. 2. pp. 159–162, fig. 1*).—A statistical analysis of data previously noted (E. S. R., 71, p. 368) indicated that neither egg production nor egg weight was significantly correlated with the percentage of thick albumen in hens' eggs, nor was there any evidence of an accumulative effect between these two factors and the percentage of thick albumen as measured by the multiple correlation coefficients. A comparison of the percentage of thick albumen from the same hens and from different hens indicated that this is a heritable characteristic, also the significant difference between the percentage of thick albumen in eggs laid during a 4-week period and among 4-week periods indicated a seasonal effect on this character.

The function of the cuticle in relation to the porosity of eggs, W. Marshall and D. B. Cruickshank (*Jour. Agr. Sci.* [*England*], *28* (*1938*), *No. 1, pp. 24–42, pl. 1, figs. 3*).—Numerous theoretical aspects of this problem are discussed in connection with a critical review of the literature.

A method is described by which it was found possible to calculate the surface area of eggs with not more than 1 percent of error. A porosity coefficient for eggs is proposed expressed as the loss in milligrams weight per square centimeter of egg surface per 24 hr. at 37° C. Determination of the porosity coefficients of several groups of eggs showed that brown eggs are less porous than white, small eggs lose weight more rapidly than large eggs due to their relatively greater evaporating surface, and thickness of shell has a definite though inconsequential influence on porosity. Evaporation from eggs averaged only 4.35 percent of that from free albumin. From information gained on the number and size of pores in eggshells, it appears that if pore orifices were regarded as the sole evaporating surface they would account for an evaporation of only 0.1154 percent. However, considering the cuticular area immediately surrounding the pore exits (areas which are well defined and stain readily by dyes penetrating from within the egg) as evaporating surfaces results in calculated evaporation areas which are of the same order of magnitude as the observed values. The apparent essentiality of such cuticular areas to the developing chick is fully discussed.

A preliminary investigation into the occurrence and causes of hair cracks in hen egg shells, [I], II, R. Coles (*Jour. Min. Agr.* [*Gt. Brit.*], *44* (*1938*), *Nos. 11, pp. 1088–1094, figs. 2; 12, pp. 1204–1213, pls. 2*).—This describes the frequency with which hair cracks, mottling, and other eggshell defects occur in the British egg supply and discusses the probable causes of such defects, with particular reference to type of soil and vegetation of different areas and their effects on the vitamin supplies in the hen's ration. The effect of shell type on egg quality is further discussed (E. S. R., 76, p. 379).

Testing eggs prior to incubation, T. C. Byerly and S. K. Haynes. (U. S. D. A.). (*Poultry Sci.*, *17* (*1938*), *No. 2, pp. 152–154*).—Eggs under 1 week old and eggs which had been stored for 3 weeks in a humid room at 55° F. were examined prior to incubation by tapping the eggs together and visual observation for cracks and shell quality, or by candling. In the case of the fresher eggs the ability of the graders to segregate eggs of low hatchability from others of higher hatchability was not sufficiently great to warrant these tests as a routine procedure for commercial hatcheries. Eggs of low hatchability were detected with greater accuracy in the lot of stored eggs. Such eggs with cracked shells, highly mobile yolks, or internal mold growth should be discarded.

Body conformation of the live market turkey, R. G. Jaap (*Poultry Sci.*, *17* (*1938*), *No. 2, pp. 120–125*).—In an effort to determine the possibility of comparing body shape of live birds through the use of linear measurements the Oklahoma Experiment Station weighed and measured (eight measurements

taken as described) 1,295 live turkeys at 27–28 weeks of age, representing five breeds and both sexes. A summary of the analyzed data is presented. It was found possible to obtain a valid numerical expression of body shape when certain linear measurements were related to the cube root of the live weight, regardless of the size differences of the birds being compared. Sex and breed differences in form are discussed.

DAIRY FARMING—DAIRYING

[Investigations with dairy cattle and dairy products in Arizona] (*Arizona Sta. Rpt. 1937, pp. 51–53*).—The results are briefly presented on the effect of stages of maturity of hairy Peruvian alfalfa on its feeding value, a comparison of hairy Peruvian v. common alfalfa hays for milking cows, the value of pasture for young calves, the relation of weight to heart-girth measurement of dairy cattle at various ages, methods of canning milk on the farm, the moisture absorption and solubility of sweet buttermilk powder, and the physiological variation of bacteria in milk at the time of reduction in the methylene blue reduction test.

[Dairy cattle investigations in Hawaii], L. A. Henke, G. W. H. Goo, and S. H. Work (*Hawaii Sta. Rpt. 1937, pp. 65, 66*).—Included are brief results of feeding tests on the value of sesame meal v. soybean oil cake and of algaroba bean meal v. pineapple bran for dairy cows, the addition of molasses to roughage as a means of increasing milk production, and a comparison of green Sudan grass v. green *Panicum* grass for milking cows.

[Experiments with dairy cattle and dairy products in Iowa] (*Iowa Sta. Rpt. 1937, pts. 1, pp. 80, 84, 85, 86, 87, 94, 130–140; 2, p. 73*).—Progress reports (E. S. R., 77, p. 235) are presented in part 1 for the following studies with dairy cattle under the leadership of J. L. Lush, C. Y. Cannon, E. N. Hansen, B. H. Thomas, D. L. Espe, and J. A. Schulz: The consequences of inbreeding Holstein-Friesian cattle, the persistency and inheritance of milk and fat production among cows in Iowa cow-testing association herds, the influence of diet on the antirachitic potency of cows' milk, the relation of vitamin E to sterility in dairy cows, a comparison of roughages and the relation of roughage to grain in the dairy cow ration, and the influence of the physical properties of milk on its rate of digestion in vivo.

Studies with dairy products for which results are presented include microorganisms causing surface taint in butter, the germicidal property of milk, classification of the organisms important in dairy products, development of butter cultures from mixtures of organisms, methods of preparing butter cultures for mail shipment, and the importance of acetylmethylcarbinol and diacetyl in butter cultures, all by B. W. Hammer; the kinds of acids in butter and the distribution of these acids between the water and fat phases of butter, the effect of neutralizers on fat losses in buttermilk and the quality of the butter, the causes of tallowy flavor in strawberry ice cream, and the quality of ice cream containing condensed milk made in stainless steel vacuum pans, all by E. W. Bird; the nitrogen metabolism of *Lactobacillus casei* cultures important in Cheddar cheese made from pasteurized milk, and the fat and protein metabolism of *Penicillium roqueforti* used in Iowa blue cheese, both by C. B. Lane and Hammer; the production of 2,3-butylene glycol in dairy products, by Hammer and C. H. Werkman; the standardization of Iowa dairy products, by M. Mortensen; and sediment tests for cream and butter, by Mortensen and Bird.

Part 2 notes experiments on the value of Cerelose for feeding dairy calves, by C. Y. Cannon and D. L. Espe.

[Investigations with dairy cattle and dairy products in Massachusetts] (*Massachusetts Sta. Bul. 347 (1938), pp. 22, 23, 24–26, 27, 28, 48–52*).—Studies by J. G. Archibald, V. A. Rice, and C. H. Parsons gave information on the effect of feeding vitamin A concentrate on reproduction in cattle; the relation of mineral supplements in the ration to the mineral constituents in milk; the influence of artificial light on milk production; the merits of molasses-grass silage; and methods of predicting the transmitting ability of dairy bulls. Investigations in dairy products include factors affecting the properties of whipped cream, and the effect of aging treatment on gelatin and other ice cream stabilizers, both by W. S. Mueller; methods of improving the flavor and keeping quality of milk and some of its products, by Mueller and M. J. Mack; sodium alginate as a stabilizer for ice cream, and the stability of fat emulsions in cream, both by Mack; changes occurring during the storage of frozen sweet cream, by H. G. Lindquist; the use of milk, cream, and plastic cream in the development of new food combinations, by J. H. Frandsen and M. Glickstein; the effect of organic and inorganic iodine on some of the milk and digestive enzymes, by Frandsen, Mueller, and Glickstein; the efficiency of water heaters, electric sterilizers, and electrically operated cooling tanks, by Frandsen, Lindquist, and Glickstein; and a comparison of new methods v. standard methods for obtaining bacterial counts on milk samples, by R. L. France.

[Investigations with dairy cattle and dairy products in Nebraska] (*Nebraska Sta. Rpt. [1937], pp. 13, 14, 59*).—Included are brief reports on the vitamin A content in butterfat from four breeds of dairy cattle; the vitamin A content of various silages; the effects of avitaminoses on the lactogenic content of the pituitary glands of rats; various factors affecting reproduction in dairy cattle; and beet tops v. alfalfa for milk production. Dairy products studies dealt with the vitamin A, B, and G content of cheese and condensed milk; the use of frozen condensed milk in ice cream mixes; and suitable mixes for home-made ice cream.

[Investigations with dairy cattle and dairy products in New Hampshire] (*New Hampshire Sta. Bul. 304 (1938), pp. 8–10*).—Brief results are noted on the value of cod-liver oil as a supplement to skim milk for calves, by K. S. Morrow; and factors affecting the solids-not-fat content of milk, by H. C. Moore and L. W. Slanetz.

[Experiments with dairy cattle and dairy products in South Dakota], T. M. Olson (*South Dakota Sta. Rpt. 1937, pp. 16–21*).—Dairy cattle investigations gave information on the effect of lack of direct sunlight on production and reproduction of dairy cows; the comparative value of sweet clover, alfalfa, Sudan grass, and permanent pastures under local conditions; and the relation of vitamin D to calcium and phosphorus retention of mature lactating cows. Studies with dairy products include the lipolytic and proteolytic bacteria in butter at various temperatures, and the development of flavor defects in butter by pure cultures of lipolytic and proteolytic bacteria isolated from defective butter.

The effect of sunlight on the growth, production, and reproduction of dairy cattle, T. M. Olson (*South Dakota Sta. Bul. 319 (1938), pp. 32, figs. 43*).—Two groups of grade Holstein heifer calves were started in this experiment, one group being confined to a closed shed without access to sunlight while the other group was maintained in direct sunlight with an open shelter against rain and snow. Otherwise the groups were fed and managed in an identical manner. The ration after weaning age consisted of liberal allowances of alfalfa hay and a grain mixture of corn, oats, wheat bran, and linseed oil meal.

The no-sunlight group made a good gain throughout the growth period, slightly exceeding the sunlight group in both weight and height at withers. No significant differences were noted in analyses or breaking strength of the bones of representative calves from the two groups.

The calcium and inorganic phosphorus of the blood of the two groups remained normal and similar, this condition holding throughout five generations of animals in the no-sunlight group. No differences were noted in reproduction, calves from heifers in both lots being normal. Cows in both lots were good producers during the first lactation, but the no-sunlight group failed to maintain the same level of production during succeeding lactations.

A test in which milk from the two groups was fed to pigs as the primary source of vitamin D indicated an appreciably greater vitamin D potency in milk from the sunlight group.

A rat feeding test comparing the vitamin D potency of milk produced under winter and summer conditions showed a greater potency in the latter, presumably due to the effect of intense sunlight on the cows and their feed.

Growth and development with special reference to domestic animals.—XLVII, A comparison of the amounts and energetic efficiencies of milk production in rat and dairy cow, S. Brody and R. Nisbet (*Missouri Sta. Res. Bul. 285 (1938), pp. 30, figs. 4*).—This series is continued (E. S. R., 79, p. 374). Two methods were employed for evaluating the milk-energy production in rats—(1) the weight gain of litters during timed suckling intervals and (2) the sum of stored and maintenance energy in litters. On the basis of data thus derived for rats and data for dairy cows previously reported (E. S. R., 75, p. 831), the relative milk-energy production of rats and cows was compared with reference to (1) body weight, (2) basal energy metabolism, (3) 0.73 power of weight, and (4) food-energy consumption or gross energetic efficiency of milk production.

The ratio of calories of milk energy produced daily to body weight in kilograms was of the order of 200 in rats and 25 in superior dairy cows. However, in comparison to the basal metabolism, or 0.73 power of weight, the milk production was of the same order in both species, the ratio of milk calories to basal metabolism calories being of the order of 2 for each.

It is concluded that the gross energetic efficiency of milk production tends to be independent of body weight, and to be the same not only for large and small animals of the same species but also in different species, as in the dairy cow and the rat.

The influence of hydrogenation and of yeast in counteracting cod liver oil injury in Herbivora, and the influence of salmon oil on milk fat secretion, C. M. McCay, H. Paul, and L. A. Maynard (*Jour. Nutr., 15 (1938), No. 4, pp. 367–375, fig. 1*).—Following the line of previous investigation (E. S. R., 75, p. 685), a preliminary trial with milking cows, in which ⅛ cc daily per kilogram of body weight of either plain or hydrogenated cod-liver oil was fed, gave evidence that ordinary oil caused a pronounced decrease in the percentage of fat in milk and an increase in the iodine number of the milk fat, while the hydrogenated oil had practically no effect on the secretion of milk fat. These findings were definitely confirmed in a more elaborate experiment as described.

In another trial two groups of five guinea pigs each were fed rations containing 4 percent of ordinary cod-liver oil and 5 percent of hydrogenated cod-liver oil, respectively. Muscular lesions developed in the animals receiving the plain oil and all succumbed within a 2-mo. period, while little or no evidence of muscular lesions was evident in the group fed hydrogenated oil. The feeding of 0.5 to 1 lb. of yeast per cow daily with the usual amount of cod-liver oil did not prevent the lowering of the percentage of fat in the milk.

Trials to determine the effect of salmon oil on milk fat secretion indicated that if any injurious factor is present in this product it is in a much lower concentration than in cod-liver oil.

The vitamin A content of soybean silage and of A. I. V., molasses, and common corn silages, and the effect of feeding these materials upon the vitamin A content of milk, I. L. HATHAWAY, H. P. DAVIS, and J. C. BRAUER (*Nebraska Sta. Res. Bul. 101 (1938), pp. 14*).—The vitamin A content of these silages and of milks from cows fed them as a sole roughage were determined by the rat assay technic. The A. I. V. silage ranked highest in vitamin A potency, containing slightly more than the molasses silage. Ordinary corn silage contained less than either of the above, and soybean silage was inferior to any of the corn silages as a source of vitamin A. The milks produced ranked in the same order as the silages.

When good alfalfa hay was fed as the only roughage the milk produced contained more vitamin A than milk produced on any of the silage rations. When A. I. V. and molasses-corn silages were each fed in combination with alfalfa hay ad libitum, the milk produced on the alfalfa-molasses silage mixture excelled in vitamin A potency, probably due to the greater consumption of hay by cows in this group.

Induced O/R potentials, rates of growth, and the volatile acid production of lactic acid bacteria in milk, J. G. DAVIS (*Jour. Dairy Res.* [*London*], *9 (1938), No. 1, pp. 85–94*).—This article records the abilities of various types of cultures (95 cultures) of lactic acid bacteria to reduce methylene blue, Janus green, litmus, neutral red, and safranine when incubated in plain milk and in milk fortified with 5 percent autolyzed yeast and 1 percent dextrose. The results show that certain types behave characteristically toward certain dyes and that these findings may be of value for identification purposes, methylene blue, litmus, and safranine giving greatest promise for this purpose. A marked correlation was noted between the rapidity of growth in milk, ability to reduce these dyes, and the proportion of the resulting byproducts. The significance of these findings with reference to the production of flavor-producing substances in cheese ripening is discussed.

The resazurin test.—A preliminary study, J. M. FRAYER (*Vermont Sta. Bul. 435 (1938), pp. 16, fig. 1*).—Samples of market milks and of individual cows' milks, drawn as aseptically as possible, were subjected to the resazurin test, the methylene blue reduction test, and to plate and cell counts. In the former test 1 cc of a 0.005 percent solution of resazurin was added to 10 cc of milk and incubated for 1 hr. at 37° C.

In this series the resazurin test correlated poorly with the methylene blue reduction test and hardly at all with the plate count, but showed fair correlation with the cell count of the near-aseptically drawn samples. It was sensitive to the presence of cells and to the presence and activity of bacteria and very sensitive to strong sunlight or artificial light.

Efficient initial cooling of milk definitely retarded resazurin reduction. A supplementary microscopic examination appeared necessary if the results of this test were used as a basis for corrective follow-up work. Special attention was needed to determine the point in the range of the color changes which separates samples needing and not needing further inspection.

The effect of commercial sterilization on the nutritive value of milk, [I–IV] (*Jour. Dairy Res.* [*London*], *9 (1938), No. 1, pp. 1–29, figs. 8*).—Five reports on this study are presented.

I. *Introduction,* S. K. Kon and K. M. Henry (pp. 1–4).—The sterilization process employed in these studies consisted in flash heating of the cold milk

to 160° F., homogenizing at about 4,000 lb. pressure, bottling, placing the open bottles in an autoclave and heating to 212°, capping the bottles at this temperature, heating further to about 230°, holding at this temperature for a short time, and then air cooling. Data are presented on the butterfat and total solids content and the bacterial counts of the milks used in the following experiments:

IIa. *Biological value and digestibility of the proteins (nitrogen) of milk*, K. M. Henry and S. K. Kon (pp. 6–11).—Rat feeding trials by the paired feeding technic showed that the proteins of raw and sterilized milk had a true digestibility of 96.4 and 95.3 percent and a biological value of 84.3 and 79.1, respectively. The differences in true digestibility were not statistically significant, but the lowering of the biological value of milk due to heat treatment was highly significant.

IIb. *A note on the effect of the method of feeding dried skimmed milk on the biological value of its proteins*, K. M. Henry, E. W. Ikin, and S. K. Kon (pp. 12–16.)—Experiments in which dried skim milk as a source of protein was fed separately from or mixed with the basal nitrogen-free diet showed that the differences in the biological value of the protein by these two feeding methods were not statistically significant. These findings do not account for the low biological value reported above for the proteins of raw liquid milk.

III. *Effect on the vitamin A and carotene content of milk*, A. E. Gillam, K. M. Henry, S. K. Kon, and P. White (pp. 17–21).—Estimation by colorimetric and spectrophotometric methods of the carotene and vitamin A contents of fat obtained from raw and sterilized milk by ether extraction indicated that the effect of the heat treatment on these factors was negligible. The vitamin A and carotene content of sterilized milk did not decrease after several weeks' storage in a cool, dark place.

IV. *Effect on the vitamin B complex, on vitamin B_1, and on vitamin B_2 (flavin) of milk*, K. M. Henry and S. K. Kon (pp. 22–29).—The general condition and growth rates of rats on a vitamin B complex deficient diet supplemented by raw or sterilized milk showed that a considerable destruction of some component or components of the vitamin B complex was caused by the heat treatment. Separate tests indicated that approximately 30 percent of the vitamin B_1 but none of the vitamin B_2 (flavine) originally present in milk was destroyed by sterilization.

Flavor and bacterial changes occurring during storage of sweet cream which has been flash pasteurized at various temperatures, M. E. Powell (*Jour. Dairy Sci., 21 (1938), No. 4, pp. 219–226, fig. 1*).—Flavor defects and the total and differential bacterial counts were determined on samples of raw cream and on portions of the same creams flash pasteurized at 155°, 165°, 175°, and 185° F. in the fresh state and after 2, 4, 6, 8, and 10 days' storage at 35°.

The reduction in numbers of bacteria surviving after pasteurization occurred inversely to the temperature of heating. The growth of organisms during 35° storage was more rapid in raw than in pasteurized creams, growth curves of the organisms being nearly flat in the latter. In raw cream the acid-coagulating type of bacteria predominated at first but was gradually replaced by peptonizing and acid-forming types. In the pasteurized creams the percentage of peptonizing types surviving pasteurization increased as temperatures increased, with this type predominating at temperatures of 165° and above. Objectionable bitter flavors which arose in raw cream after a brief storage period were entirely prevented during the 10-day storage period by pasteurization at 165° or above. However, pasteurization at temperatures of above 165° gave objectionable heated flavors. Late spring and summer creams pasteurized at 155° retained excellent flavor over a 10-day period.

Studies on the neutralization of cream for buttermaking, V, VI (*New Zeal. Jour. Sci. and Technol., 19 (1937), Nos. 5, pp. 296–312, figs. 2; 6, pp. 345–360*).—Further reports are presented in this series (E. S. R., 79, p. 100).

V. *The reaction of sodium bicarbonate on milk and cream and the effect of pasteurization on the reaction*, F. H. McDowall and A. K. R. McDowell.—Trials to determine the effect of adding sodium bicarbonate to fresh skim milk and to highly acid milk and cream showed that immediately after such additions there was practically no change in the acidity of the fresh milk and only a small though definite reduction in the acidity of acid milk or cream. The pH was slightly increased with each product. After heat treatment, either by warming the samples to 190° F. for 1 min. or boiling for 1 min., the reduction in acidity of the fresh skim milk due to loss of natural carbon dioxide was greater than the theoretical neutralizing value of sodium bicarborate, i. e., 1.2 lb. of lactic acid was neutralized by 1 lb. of sodium bicarbonate. With highly acid cream of low carbon dioxide content the sodium bicarbonate acted stoichiometrically, i. e., 1.07 lb. of lactic acid was neutralized to 1 lb. of the bicarbonate providing that pasteurization was accomplished with sufficient temperature and adequate agitation. The loss of carbon dioxide from cream was somewhat greater in a steam-vacreator pasteurizer than in the tandem-flash equipment. When neutralization was carried to a very low acidity, e. g., 0.03 percent, some residual carbon dioxide was still present even in the vacuum-treated cream.

VI. *Factors affecting the pH of salted butter; the relation of pH to quality of salted butter*, F. H. McDowall, J. W. Smith, and A. K. R. McDowell.—A survey of conditions prevailing in the butter industry in New Zealand, along with a series of experiments at the Dairy Research Institute, led to the general conclusion that the neutralization of cream to yield butters of high pH accentuates the flatness of flavor and also increases the incidence of soda flavor in the product. Neutralized high acid creams gave butter which showed soda flavor at a lower pH than the low acid cream. There was no evidence of any loss in keeping quality in butters of pH 6.8–7.0 as compared with those of higher pH, and the manufacture of butter within this pH range is considered the safest course for most factories.

The influence of acidity variations during manufacture on the quality and rate of ripening of blue or American Roquefort cheese, S. T. Coulter, W. B. Combs, and J. S. George. (Minn. Expt. Sta.). (*Jour. Dairy Sci., 21 (1938), No. 4, pp. 239–245, fig. 1*).—Blue cheeses were manufactured from milk which had received 2, 3, and 4 percent starter, the milks being set at low acidity (0.19–0.2 percent) and after ripening to 0.23–0.24 percent acidity. The curds were dipped after cutting before additional acidity developed and after 0.05–0.06 percent acidity had developed in the whey. Within the ranges described these variations had only a slight effect on the quality of cheese, all combinations yielding an excellent product. Cheeses set and dipped at low acidity ripened somewhat sooner than those set and dipped at high acidity.

Alcohol-glycerol rennet preparations in cheese-making, J. G. Davis (*Jour. Dairy Res. [London], 9 (1938), No. 1, pp. 80–84*).—A comparison was made of alcohol-glycerol and brine extracts of rennet for cheese making, with particular reference to bacteriology, cheese-making aspects, keeping quality of the rennet solution, and rates of protein break-down in the cheese. The alcohol-glycerol solution averaged much lower in bacterial content (practically sterile) and exhibited better keeping qualities when exposed to light at room temperature than brine rennet. The character of the curd, flavor, body, and texture of the cheese, and the rate of protein break-down during curing in cheese produced

with the alcohol-glycerol rennet compared favorably with the brine-rennet product.

Annatto as a cheese colour, M. S. Carrie (*Jour. Dairy Res. [London], 9 (1938), No. 1, pp. 72–79, figs. 2*).—The author presents data indicating that the intensity of color of commercial annatto solution is directly proportional to the dilution, following Beer's law closely in every case. These results are at variance with the findings of Barnicoat (E. S. R., 77, p. 390). Since neither in alkaline nor acid aqueous solution is annatto in the same form as it is in cheese, it appears that standardization of annatto in aqueous solution is an unsound practice. Standardization on the basis of the depth of color produced in cheese itself is recommended.

VETERINARY MEDICINE

[Work in animal pathology by the Arizona Station] (*Arizona Sta. Rpt. 1937, pp. 38–40*).—A brief report of the work of the year, including routine autopsies and disease control and studies of plants poisonous to livestock.

[Work in animal pathology by the Florida Station] (*Florida Sta. Rpt. 1937, pp. 52, 57, 58, 59, 60*).—The work of the year (E. S. R., 77, p. 99) relates to investigations of hemorrhagic septicemia in cattle and swine, by D. A. Sanders (E. S. R., 77, p. 542); the etiology of fowl paralysis, leukemia, and allied conditions in animals, by M. W. Emmel (E. S. R., 78, p. 256); and a study of plants poisonous to livestock in Florida, by Sanders, Emmel, and E. West. Some of the pathological conditions found responsible for livestock losses of the year are listed.

[Work in animal pathology by the Iowa Station] (*Iowa Sta. Rpt. 1937, pt. 1, pp. 103, 104, 157–159*).—The work of the year (E. S. R., 77, p. 253) includes (1) the etiology of range paralysis in poultry and (2) the egg as a possible mode of its transmission, both by C. Murray, C. D. Lee, and H. L. Wilcke; breeding for resistance to fowl typhoid in poultry, by E. W. Lindstrom, J. W. Gowen, and N. F. Waters; and genetic investigation of resistance and susceptibility to typhoidlike diseases in laboratory animals, by Lindstrom and Gowen.

[Report of work in animal pathology by the Kentucky Station] (*Kentucky Sta. Rpt. 1937, pt. 1, pp. 5, 20–24*).—The work of the year referred to (E. S. R., 77, p. 848) includes the determination of the cause and the prevention of periodic ophthalmia in horses, the eradication of Bang's disease, the differentiation of *Salmonella typhimurium* (*aertrycke*) cultures from pigeons and other animals (E. S. R., 79, p. 111) and from humans and animals, the finding of *S. newport* in chickens and swine as well as in feeder cattle, the identification of *S. new-brunswick* and isolation of a new species of *Salmonella*, *S. kentucky*, the development of positive methods of differentiation of cultures of *Corynebacterium equi* isolated from cases of pneumonia of foals from certain closely related cultures derived from the genital tract of mares and from fetuses, the occurrence and control of trichomoniasis in dairy cattle, and the occurrence of paralysis in colts.

[Work with poultry diseases by the Massachusetts Station] (*Massachusetts Sta. Bul. 347 (1938), pp. 91–93*).—The work of the year reported upon (E. S. R., 77, p. 856) relates to pullorum disease eradication (E. S. R., 78, p. 542), diagnosis, flock mortality studies, erysipelas outbreaks in turkeys (E. S. R., 79, p. 244), epidemic tremor in chicks, feeding sumac fruit to chickens, and the viability of *Salmonella pullorum*, all by H. Van Roekel, K. L. Bullis, O. S. Flint, and M. K. Clarke; and studies of neoplasticlike diseases, by C. Olson, Jr.

[Work with animal diseases by the Nebraska Station] (*Nebraska Sta. Rpt. [1937], pp. 7–9*).—The work of the year reported upon relates to the nature of certain phases of swine erysipelas and a proposed method for the immunization of swine against hog cholera.

[Work in animal pathology by the Nevada Station] (*Nevada Sta. Rpt. 1937, pp. 23, 24, 31–33, fig. 1*).—The work of the year (E. S. R., 78, p. 393) relates to livestock deaths caused by *Astragalus speirocarpus;* swellhead in sheep and *Tetradymia glabrata;* alkaloids of *Lupinus confertus*, by M. R. Miller; hemorrhagic disease in cattle (including improvements in serums used in the treatment of cases of the red water disease and in cultural methods), by E. Records and L. R. Vawter; and encephalomyelitis in equines, including checking the disease by serum treatment, prevention by immunization, and preventive treatment (in cooperation with the Montana Station), by Records and Vawter.

[Work in animal pathology by the New Hampshire Station] (*New Hampshire Sta. Bul. 304 (1938), pp. 30, 31, 36–38*).—The work of the year referred to (E. S. R., 78, p. 99) includes a study of bovine mastitis, by L. W. Slanetz and C. L. Martin; hemolytic streptococci in pasteurized milk, by Slanetz; the vaccination of young calves, by Martin; the use of acidophilus milk in the control of coccidiosis, by Martin, T. B. Charles, and R. C. Durgin; pullorum eradication, by C. A. Bottorff; Bang's disease tests, by Martin; poultry autopsies, by Martin and Bottorff; fowl pox vaccine distribution, by Martin; and laryngotracheitis vaccine distribution, by Bottorff.

[Work with animal diseases by the Rhode Island Station] (*Rhode Island Sta. Rpt. [1937], pp. 39, 40*).—The work reported upon (E. S. R., 77, p. 856) relates to infectious coryza, with reference to studies of the Rhode Island strain of *Hemophilus gallinarum;* infectious bronchitis, with reference to (1) infection of the bursa of Fabricius with *H. gallinarum*, (2) its use as a vaccine, and (3) the use of sulfanilamide in 3-grain daily dosages; encephalomalacia (cerebral disorder of young chicks); and disease determinations, including the finding of a case of tularemia in a wild rabbit.

[Work with livestock diseases and parasites by the South Dakota Station] (*South Dakota Sta. Rpt. 1937, pp. 15, 16, 30, 31, 36, 37*).—The work of the year (E. S. R., 77, p. 100) reported upon includes the form of selenium in the soil, the failure of sulfur to inhibit the absorption of selenium by plants, selenium analysis, and cooperative projects with the poultry department on alkali disease, all by A. L. Moxon; the treatment of ascarids in pigs, by F. J. LeBlanc and T. R. Wright; and the production of immunizing agents for hemorrhagic septicemia and a study of the toxic properties of hemorrhagic septicemia organisms (E. S. R., 77, p. 850), both by C. C. Lipp.

[Contributions on animal parasitology] (*Helminthol. Soc. Wash. Proc., 4 (1937), Nos. 1, pp. 21–24, 29–32, 38, 39, figs. 3; 2, pp. 52, 53, 54, 62, 63, 65–69, 72–75, figs. 2; 5 (1938), No. 1, pp. 1–5, 7, 8, 18, 19, 20, 24, 33, 34, figs. 2*).—Contributions relating to helminth parasites of economic importance and control measures (E. S. R., 78, p. 250) include the following:

Vol. 4, No. 1.—Two New Avian Liver Flukes [*Athesmia wehri* n. sp. and *A. pricei* n. sp.], With a Key to the Species of the Genus *Athesmia* Looss 1899 (Dicrocoeliidae) (pp. 21–23) and A New Trematode, *Postharmostomum noveboracensis* n. sp. (Brachylaemidae), From a Chipmunk (pp. 23, 24), both by A. McIntosh; A Species of Orthoptera [*Scyllina cyanipes* (F.)] Serving as Intermediate Host of *Tetrameres americana* of Poultry in Puerto Rico, by E. B. Cram (p. 24); The Infections Produced in Rats by a Single Larva of *Strongyloides ratti*, by G. L. Graham (pp. 29, 30); A New Species of Cestode, *Dendrouterina nycticoracis* (Dilepidiidae), From the Black-Crowned Night Heron

(*Nycticorax nycticorax hoactli* (Gmelin)), by O. W. Olsen (pp. 30–32) (Minn. Expt. Sta.); Tapeworm Studies—IV, *Moniezia expansa* of Sheep Strain Contracted by Calf, by N. R. Stoll (p. 32) (E. S. R., 75, p. 696); and The Frequency of Change of Cecal Contents in Fowls, by P. D. Harwood (pp. 38, 39).

Vol. 4, No. 2.—A Method of Separating Infective Larvae of *Haemonchus contortus* (Trichostrongylidae) From Free-Living Nematodes, by D. A. Shorb (p. 52); Experiments to Determine the Nematocidal Qualities of Beta Naphthol, Colloidal Arsenate of Lead, and Colloidal Sulphur, by C. W. McBeth (pp. 53, 54); Infestation of Suckling Pigs With Helminth Parasites Under Conditions of Constant Exposure to Infection, by L. A. Spindler (pp. 62, 63); A Note on the Location of the Nematode *Cooperia curticei* (Trichostrongylidae) in Sheep, by J. S. Andrews (p. 65); Two New Species of the Nematode Genus *Nematodirus* (Trichostrongylidae) From Rabbits, by G. Dikmans (pp. 65–67); The Hosts of *Diphyllobothrium mansonoides* (Cestoda: Diphyllobothriidae), by J. F. Mueller (pp. 68, 69); and A New Species of Cestode, *Dendrouterina lintoni* (Dilepidiidae), From the Little Green Heron (*Butorides virescens* (Linn.)), by O. W. Olsen (pp. 72–75) (Minn. Expt. Sta.).

Vol. 5, No. 1.—Description and Differentiation of Infective Larvae of Three Species of Horse Strongyles, by J. T. Lucker (pp. 1–5); Check List of Parasites Found Among Principal Domestic Animals in Puerto Rico, by H. L. Van Volkenberg (pp. 7, 8) (Puerto Rico Expt. Sta.); Notes on the Physiology of *Ascaris lumbricoides*, by B. G. Chitwood (pp. 18, 19); The Raccoon, a New Host of *Ascaris columnaris* Leidy 1856 (Nematoda: Ascaridae), by O. W. Olsen and R. Fenstermacher (p. 20); Occurrence of the Coccidian *Eimeria bukidnonensis* in American Cattle, by J. F. Christensen (p. 24); and Effects of Treatment With Brilliant Green on Some Tapeworms Infesting Poultry, by P. C. Underwood, P. D. Harwood, and J. M. Schaffer (pp. 33, 34).

[Contributions on animal parasites and their control] (*Jour. Parasitol., 23 (1937), No. 5, pp. 534, 535, 536, 537*).—Abstracts of contributions presented at the meeting of the American Society of Parasitologists held in June 1937 include the following: The Rocky Mountain Spotted Fever Tick *Dermacentor andersoni*, by R. A. Cooley (p. 534): Sylvatic Plague, by C. R. Eskey (p. 534); Sylvatic Plague in Montana, by W. L. Jellison, R. R. Parker, and G. E. Davis (p. 535); Notes on Some Cimicid Parasites of Man and Animals, by G. M. List (p. 535); The Geographic Distribution of *Diphyllobothrium latum*, by T. B. Magath (p. 535); Some External Parasites of the Rodent Family Sciuridae, by S. C. McCampbell (pp. 535, 536); The Life History of *Diphyllobothrium mansonoides*, With Some Consideration With Regard to Sparganosis in the United States, by J. F. Mueller (p. 536); Some Observations on the Biology of Mosquitoes, by W. B. Owen (p. 536); Carbon Tetrachloride Poisoning in Sheep, by J. N. Shaw (pp. 536, 537); The Influence of *Diphyllobothrium latum* Infestation Upon Dogs, by R. A. Wardle (p. 537); and Two Species of *Triatoma* (Reduviidae) [*T. pallidipennis* (Stal) and *T. phyllosoma* (Burm.)] From Mexico Naturally Infected With *Trypanosoma cruzi* Chagas, by B. G. Whitaker and L. Mazzotti (p. 537).

The distribution of Paragonimus, G. R. La Rue and D. J. Ameel (Univ. Mich.). (*Jour. Parasitol., 23 (1937), No. 4, pp. 382–388*).—This contribution is presented with a list of 37 references to the literature.

Tick-host anemia: A secondary anemia induced by Dermacentor andersoni Stiles, W. L. Jellison and G. M. Kohls (*Jour. Parasitol., 24 (1938), No. 2, pp. 143–154*).—In the experiments conducted the authors have repeatedly produced a secondary anemia in rabbits by heavy infestations of the Rocky Mountain wood tick *D. andersoni*. This condition is noninfectious, being due pri-

marily to exsanguination by the rapidly engorging female ticks, and is comparable to the anemia observed in tick-infested domestic stock and game animals. It is pointed out that tick-host anemia is not only an experimental disease but occurs with some frequency in nature and may be the immediate cause of death in animals.

The action of preservatives and salts on blackleg cultures, J. P. Scott (*Jour. Infect. Diseases, 61 (1937), No. 1, pp. 103–109*).—Experiments conducted at the Kansas Experiment Station during the past 7 yr., on the action of disinfectants on anaerobic cultures and on the production of blackleg bacterins by the use of these disinfectants, together with tests of many of these disinfectants on aerobic spore-forming organisms, are reported, the details being presented in tables.

Anaerobic organisms were found to be more resistant to the action of disinfectants than are aerobic spore-forming species. "Proteolytic anaerobes are much more resistant than the saccharolytic types, and of these *Cl[ostridium] chauvei* is the least resistant. Iodine, metaphen, and azamine did not sterilize any of the anaerobic organisms tested. Phenol and formaldehyde may be used for the rapid isolation of anaerobic organisms from spore-forming aerobic bacteria. Formaldehyde, acetaldehyde, and merthiolate when added to blackleg filtrates and bacterins increased the aggressive potency; phenol, chloropicrin, phenyl mercury nitrate, and the higher aldehydes had no such action. Sodium formate and sodium sulfite added to culture media used in the production of blackleg filtrate did not increase the potency of the product. Sodium salicylate added to blackleg filtrates increased the aggressive potency. Potassium ilum added to blackleg filtrates and bacterins produced a highly efficient immunizing agent for guinea pigs but did not greatly increase the aggressive activity of the products. The precipitate formed by the action of potassium alum on blackleg filtrates and bacterins contained almost the entire amount of antigenic and aggressive substances. Blackleg filtrates having an aggressive potency of 13 to 26 aggressive units reduced losses among vaccinated cattle to about 1 out of 10,000 head. Blackleg filtrates and bacterins having a potency of 30 to 130 units have reduced losses to less than 1 out of 20,000 vaccinated animals."

A list of 37 references to the literature is included.

Quantitative studies of Brucella precipitin systems, I, II, R. B. Pennell and I. F. Huddleson. (Mich. Expt. Sta.). (*Jour. Expt. Med., 68 (1938), No. 1, pt. 1, pp. 73–81, fig. 1; 83–93, figs. 3*).—Part 1 of this contribution relates to precipitation of homologous antiserums by *Brucella* endoantigens and part 2 to the precipitation of heterologous antiserums by *Brucella* endoantigens.

"It has been shown that the precipitation by the endoantigens of the three species of *Brucella* of their homologous antibodies may be described by equations developed from the law of mass action. The endoantigens may be used for the accurate calibration of *Brucella* antiserums. The nitrogen-containing constituent of the endoantigens does not always seem to be intimately connected with the ability to precipitate the specific antibodies. . . .

"Quantitative cross precipitation studies with goat antiserums show the three endoantigens of the *Brucella* to be serologically distinguishable. Although the endoantigens of *B. abortus* and *B. suis* are very similar, they do not react identically, permitting the serological distinction of the two organisms. These differences in cross precipitation may be used to identify an organism of the *Brucella* group or to determine the organism responsible for a *Brucella* antiserum."

Production of experimental osteomyelitis in rabbits by intravenous injection of Staphylococcus aureus, R. H. S. Thompson and R. J. Dubos

(*Jour. Expt. Med.*, 68 (1938), No. 2, pp. 191–206, pls. 2, fig. 1).—A description is given of the conditions under which a certain strain of *Staphylococcus* (OH 172) causes in rabbits the development of bone inflammation. "The virulence of the strain for rabbits was markedly raised by passage through this animal species, and especially after the culture had been recovered from a bone abscess. The results indicate that it is possible to produce consistently inflammation of the bones of rabbits by the mere intravenous injection of a suitable strain of *Staphylococcus*, without resorting to any elaborate operative technic designed to localize the organisms in the bones. It appears also that the inflammatory process so produced bears a close resemblance to staphylococcal osteomyelitis as occurring in human beings."

Ineffectiveness of sulfanilamide in the treatment of trichiniasis in rats, O. R. McCoy (*Soc. Expt. Biol. and Med. Proc.*, 38 (1938), No. 4, pp. 461, 462).—Experiments on full-grown rats infected by stomach tube with known numbers of *Trichinella spiralis* larvae (obtained free from infected rat muscle by artificial digestion) and treated with doses of 125 mg per day of sulfanilamide failed to show any benefits from this drug.

Species and incidence of dipterous larvae concerned in wound myiasis, E. F. Knipling and H. T. Rainwater (*Jour. Parasitol.*, 23 (1937), No. 5, pp. 451–455).—Determinations made of 901 lots of larvae collected from wounds in man and animals in the southeastern, middle western, and southwestern sections of the United States have shown the screwworm (*Cochliomyia americana* C. & P.) to be involved in approximately 90 perecnt of the cases of myiasis, with the secondary species as a group involved in approximately 13 percent of the total number. The following forms, given in order of their incidence, were taken from wounds: The screwworm, *Phormia regina* Meig., *Lucilia* spp., the secondary screwworm, flesh flies, bluebottle flies, the housefly, *Cynomyia cadaverina* Desv., the stablefly, and *Hermetia* spp. Of the species of the genus *Lucilia*, *L. sericata* Meig. was the most commonly taken in myiasis. *L. caeruleiviridis* Macq. and *L. cluvia* Walk. were also concerned in the production of myiasis. Apparently the two species last mentioned have not previously been reported from wounds of animals. *Sarcophaga bullata* Park. is the most common species of the Sarcophagidae concerned in myiasis in the Southeast. Secondary species as a group apparently attack a greater variety of hosts than does the screwworm. A host list for the screwworm and for the secondary species is included.

Bang's disease (infectious abortion of cattle), H. Welch (*Montana Sta. Circ.* 152 (1938), pp. 11, figs. 3).—A practical summary of information.

Increase of bactericidins in the serum of cattle following recovery from infection with Brucella abortus, M. R. Irwin and L. C. Ferguson. (Wis. Expt. Sta. and U. S. D. A.). (*Soc. Expt. Biol. and Med. Proc.*, 38 (1938), No. 4, pp. 451, 452).—Earlier results having shown that bovine serum displays a greater bactericidal activity against *B. abortus* than does a comparable amount of whole blood (E. S. R., 75, p. 253), attempts were made to determine whether an increase in the titer of the serum bactericidins is present in individuals which have recovered from an infection with this organism. The findings indicate the presence of such immune bactericidins following an infection, in the absence of an appreciable titer of agglutinins.

Posterior paralysis in a cow caused by a tumor, L. P. Doyle. (Ind. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc.*, 93 (1938), No. 1, pp. 44, 45, figs. 2).—A report of a case observed in a Shorthorn cow.

Some histopathological changes caused by Hypoderma larvae in the esophagus of cattle, S. W. Simmons. (U. S. D. A.). (*Jour. Parasitol.*, 23

(1937), No. 4, pp. 376–381, figs. 6).—This describes some of the changes brought about in the esophageal tissue of cattle invaded by the common cattle grub.

Toxicity of selenium fed to swine in the form of sodium selenite, W. T. Miller and H. W. Schoening. (U. S. D. A.). (*Jour. Agr. Res.* [*U. S.*], *56* (*1938*), *No. 11*, *pp. 831–842*, *figs. 3*).—In order to determine the relationship of selenium to the so-called alkali disease and the effects of selenium in feed given to pigs at different levels over a period of time, experiments were conducted as follows: "Eight pigs about 4 mo. old were divided into four groups and were fed an adequate grain ration to which selenium in the form of sodium selenite was added in the proportions of 392, 196, 49, and 24.5 p. p. m., respectively. Four, or 50 percent, of these animals showed clinical symptoms similar to those seen in natural cases of so-called alkali disease, manifested by a loss of hair and interference with the growth of the horn of the hoof. All the animals died in from 10 to 99 days and showed post-mortem lesions similar to those seen in the so-called alkali disease. Two other pigs, fed the same grain to which no sodium selenite had been added, made normal gains in weight during the feeding period and remained healthy at all times. The pigs fed the sodium selenite ate very sparingly, leaving a large part of their daily ration untouched, and their loss in weight may be attributed, at least in part, to this factor. The two control pigs, kept under identical conditions and receiving the same feed except for the addition of sodium selenite, made gains in weight and remained healthy at all times. After the first few feedings there was evidence of a marked aversion to the feed to which selenium was added. After refusing this feed, animals readily ate normal feed on several occasions when it was offered to them. Aversion to grain in which selenium occurs under natural conditions has been reported from the field."

[**Studies of equine encephalomyelitic viruses**], A. B. Sabin and P. K. Olitsky (*Soc. Expt. Biol. and Med. Proc.*, *38* (*1938*), *No. 4*, *pp. 595–599*).—The first of two contributions deal with Variations in Pathways by Which Equine Encephalomyelitic Viruses Invade the CNS [Central Nervous System] of Mice and Guinea-Pigs (pp. 595–597); the second, with Age of Host and Capacity of Equine Encephalomyelitic Viruses to Invade the CNS (pp. 597–599).

Studies of the conditions which permit or prevent invasion of the central nervous system of mice and guinea pigs by the viruses of vesicular stomatitis and equine encephalomyelitis have thus far disclosed that depending upon the age or species of the host there may be changes or variations in localized sites, e. g., in terminal, specialized nerve endings, in special areas of the central nervous system, blood vessels, etc., which can prevent the virus from invading or progressing in the central nervous system—changes in different tissues functioning as barriers for different viruses depending upon the mode of invasion utilized by the virus.

Intraperitoneal and intracerebral routes in serum protection tests with the virus of equine encephalomyelitis.—I, A comparison of the two routes in protection tests, P. K. Olitsky and C. G. Harford (*Jour. Expt. Med.*, *68* (*1938*), *No. 2*, *pp. 173–189*).—In the work reported it was found that mice from 12 to 15 days old are about as susceptible to the virus of equine encephalomyelitis, eastern or western strain, when it is given intraperitoneally as are adult mice when the virus is injected intracerebrally. With this susceptibility by the intraperitoneal route as a basis, the injection of immune serum-virus mixtures intraperitoneally was found to result in protection in dilutions which give rise to infection after intracerebral inoculation.

"The difference of protective power by the two indicated routes was shown not to depend on the amount of inoculum nor on the age of the intracerebrally

injected mice. Incubation at 37° C. for 2.5 hr. neither increases nor diminishes the protective action of immune serum when the intraperitoneal method is employed. The phenomenon of selective protection in different tissues is elicited by the serums of hyperimmunized mice, guinea pigs, and rabbits and by serums derived from horses infected with the disease in nature or exposed to it by contact. Of four horses recovered from the malady, all showed antibody in their serums; of others exposed by contact, four of nine animals revealed antiviral bodies when the intraperitoneal technic was employed. These tests on horse serums have pointed to the potential value of this procedure for epidemiological studies."

Method of transmission of immunity to equine encephalomyelitic virus in the guinea pig, B. F. Howitt (*Jour. Infect. Diseases, 61 (1937), No. 1, pp. 88–95*).—Young guinea pigs born of mothers immune to eastern and western American strains, respectively, of equine encephalomyelitic virus are immune usually for at least a month after birth if either weaned or unweaned. There is no change in immunity of the young born of parents immune to American strains upon transference to normal mothers, even though the transfer occurs on the day of birth. Adult and fetal serums of immune pregnant guinea pigs contain neutralizing substances to eastern and western American strains of virus, while the amniotic fluids from animals immune to the eastern but not to the western types give positive neutralization. From the data presented it is considered more probable that immunity is transferred to the young guinea pigs by way of the placenta than by the milk.

Brucella abortus in horses, A. W. Deem (*Jour. Infect. Diseases, 61 (1937), No. 1, pp. 21–25*).—A detailed account of work an abstract of which has been noted from another source (E. S. R., 77, p. 400).

A further report on the parasites of a selected group of equines in Panama, A. O. Foster and Pedro Ortiz O (*Jour. Parasitol., 23 (1937), No. 4, pp. 360–364, fig. 1*).—A quantitative study made in the Panama Canal Zone during 1935 and 1936 of parasites of 97 equines, or 49 additional to those noted (E. S. R., 77, p. 252), resulted in the recovery of 34 species of Strongylidae, in 15 of which 98 percent of the strongylid parasites were present. Nineteen species occurred at one time or another in the cecum, but the average was 5. The 5 commonest species in this region accounted for 97 percent of the fauna, viz, *Strongylus vulgaris, Cyathostomum coronatum, Cylicostephanus calicatus, S. equinus,* and *Cylicocyclus nassatus.* Twenty-six species occurred in the ventral colon, but the average was 11. The 11 commonest accounted for about 98 percent of the fauna, viz, *Cylicocyclus nassatus, Cylicostephanus calicatus, C. minutus, Cylicocercus catinatus, Cyathostomum labiatum, Cylicocercus pateratus, Cyathostomum labratum, Triodontophorus minor, S. edentatus, Cylicocyclus leptostomus,* and *S. vulgaris.* Thirty-one species occurred in the dorsal colon, but the average was only 5. The 5 commonest accounted for over 97 percent of the fauna, viz, *Cylicostephanus longibursatus, Cylicocyclus insigne, Cylicocercus goldi, Cylicocyclus nassatus,* and *Cylicocercus catinatus.* Ten species of extra-Strongylidae were recoverd, although 3 was the average per animal. The 3 commonest were *Habronema muscae, H. microstoma,* and *Probstmayria vivipara.* No trematodes, lungworms, or "bots" were found. See also a note by Foster (E. S. R., 77, p. 855).

Fowl leukosis, C. D. Lee, H. L. Wilcke, C. Murray, and E. W. Henderson (*Jour. Infect. Diseases, 61 (1937), No. 1, pp. 1–20*).—This contribution has been noted from another source (E. S. R., 77, p. 856).

Study of a paratyphoid infection in chicks, O. W. SCHALM (*Jour. Infect. Diseases, 61 (1937), No. 2, pp. 208–216*).—A disease that is causing extensive losses of chicks in California has been found to be due to a paratyphoid organism morphologically and biochemically similar to *Salmonella typhimurium*. "The findings indicated, but did not prove, that the chicks became infected in the incubators after hatching with the organism present in fecal contamination on the shells of the eggs. That infection could take place in this manner was shown by the occurrence of the disease in chicks hatched from eggs the shells of which had been lightly painted with a mixture of a broth culture of the organism and sterilized chicken feces. It was also shown that, under such conditions, the organisms survived exposure to incubator temperature for as long as 111 days. It appears that chilling was a factor in producing the high mortality observed in certain lots of naturally infected chicks. Chicks 4 days old were not affected by oral administration of broth cultures of the organism, and chicks 63 days old were quite resistant to an intravenous injection of a saline suspension of the bacillus. The organism readily left the blood stream and localized in the liver and spleen, especially the latter, from which it was recovered at intervals for as long as 125 days. The blood serum of these chicks contained either no agglutinating antibodies or very few. Blood serum from 2,120 chickens in the breeding stock and from 557 survivors of the outbreak in chicks failed to agglutinate an autogenous antigen or a standard pullorum antigen by the tube agglutination method. The disease was successfully controlled by fumigation of the incubators with formaldehyde gas at hatching time."

Coccidiosis of poultry: Causes, symptoms, lesions, and preventive measures, R. GRAHAM and C. A. BRANDLY (*Illinois Sta. Circ. 485 (1938), pp. 16, figs. 8*).—A practical summary of information.

Excystation of the coccidia Eimeria tenella, I. PRATT. (Univ. Wis.). (*Jour. Parasitol., 23 (1937), No. 4, pp. 426, 427*).—Observations made to determine the place or places in the digestive tract at which excystation of *E. tenella* occurs revealed that the freeing of the spores from the oocysts and the liberation of the sporozoites may occur in the crop. In a total of eight chickens and three different occasions spores or sporozoites were demonstrated in material recovered from the crop. In some experiments only 5 min. were required to bring about excystation in the crop, as demonstrated by the presence of spores and sporozoites.

The effect of various environmental conditions on the viability of the ova of Capillaria columbae (Rud.), P. P. LEVINE (Cornell Univ.). (*Jour. Parasitol., 23 (1937), No. 4, pp. 427, 428*).—The observations briefly reported indicate that the destruction of ova of *C. columbae* will take place in the shortest time (20 days) on a well-drained, unshaded poultry range.

The life history of Choanotaenia infundibulum, a cestode parasitic in chickens, M. W. HORSFALL and M. F. JONES (*Jour. Parasitol., 23 (1937), No. 5, pp. 435–450, figs. 6*).—In the course of the study here reported of *C. infundibulum*, a cestode parasitic in the intestine of chickens, turkeys, and several species of game birds, cosmopolitan in distribution, the following species of new intermediate hosts were discovered: *Stenocellus debilipes, Stenolophus conjunctus, Alphitophagus bifasciatus, Apocellus sphaericollis, Ataenius cognatus, Alphodius* sp., *A. granarius, Dichromorpha viridis*, and the red-legged grasshopper. Laboratory-raised chickens were infected with this tapeworm by feeding them cysts from experimentally infected beetles (*A. granarius*) and the red-legged grasshopper. At 75° to 90° F., from 17 to 20 days is the minimum time for

development of the cysticercoids to the infective stage in the red-legged grasshopper. In the beetle *A. granarius*, 48 days is the minimum time for development at from 60° to 75°.

Trichomoniasis of turkeys, M. C. Hawn (*Jour. Infect. Diseases, 61 (1937), No. 2, pp. 184–197*).—A disease of turkeys that was first described by Jungherr in 1927 and referred to as mycosis (E. S. R., 58, p. 180) is reported upon in this contribution from the North Dakota Experiment Station. The investigation conducted by the author has led to the conclusion that bacteria have no direct causative relation to this characteristic disease of the esophagus and crop. This assumption is based on the following evidence:

"The disease has been produced in 54 percent of the turkeys inoculated with viable cultures of *Trichomonas diversa*. The cultures used in this work were propagated in culture media for periods ranging from 2 days to 7 mo. Turkeys inoculated with cultures in which the trichomonads had been killed by storage or evaporation failed to show microscopic evidence of the disease. It was successfully transmitted with the same cultures containing viable *T. diversa*. The disease has been reproduced with cultures of *T. diversa* isolated from carriers. It does not appear probable that the death point of bacteria, if we assume such to be the etiological agent, should parallel that of *T. diversa*. *T. diversa* is regularly found associated with the esophageal lesions in fresh pathological specimens. Mass bacterial cultures free of *T. diversa* failed to reproduce the disease. Evidence, based on analogy, is presented to show that the disease is caused by *T. diversa*, and the name trichomoniasis of the upper digestive tract is therefore proposed. *T. diversa* localizes mainly in the upper digestive tract. It has been found less frequently in the duodenum and ceca. *T. diversa* became established in the upper digestive tract of pigeons and chickens but did not produce lesions during the period of observation."

The similarity between the flagellate of turkey trichomoniasis and T. columbae in the pigeon, R. M. Stabler (*Jour. Amer. Vet. Med. Assoc., 93 (1938), No. 1, pp. 33, 34, fig. 1*).—The author concludes from the observations reported that the flagellate *Trichomonas diversa* is synonymous with *T. columbae*, that the trichomonad disease in the turkey and in the pigeon is caused by this organism, and that the pigeon is the ultimate source of infection.

AGRICULTURAL ENGINEERING

[**Agricultural engineering investigations by the Arizona Station**] (*Arizona Sta. Rpt. 1937, pp. 14–27, figs. 3*).—Progress results are briefly presented of investigations on ground water, conditions in the Eloy pumping district, corrosion of well casing, ground water law, methods of measurement of flow of water, Diesel engine-driven pumping plants, the cost and relative economy of power for deep-well pumping from Diesel engines, natural gas engines, and electric motors, and the use of solid carbon dioxide in well development.

[**Agricultural engineering investigations by the Iowa Station**], H. Giese, J. B. Davidson, E. V. Collins, H. J. Barre, C. K. Shedd, H. D. Hughes, L. C. Burnett, and A. L. Bakke (*Iowa Sta. Rpt. 1937, pts. 1, pp. 48–52, fig. 1; 2, pp. 19–21, 22, 23, fig. 1*).—In part 1 the progress results are briefly reported of investigations on a domestic spark arrester; the kinematics and dynamics of transport wheels used on agricultural equipment; the basin method of treating pastures to prevent erosion, run-off, and loss of fertility; utilization of agricultural wastes for farm building insulation; development of a two-way terracing machine; and utilization of plywood in farm building construction. In part 2 results are briefly presented of studies on the efficiency of corn

pickers, equipment for seedbed preparation, planting, cultivating, and harvesting, and equipment and structures for the curing and storage of corn.

[Agricultural engineering investigations of the Nebraska Station] (*Nebraska Sta. Rpt. [1937], pp. 5–7, 55*).—The progress results are briefly presented of investigations on water heating for livestock, performance of rubber tires on tractors, mechanical equipment for the eradication of bindweed, adaptability of electric hotbeds to farm use, adaptation of insulated electric brooders in uninsulated poultry houses, and pump irrigation.

[Agricultural engineering investigations at the New Hampshire Station] (*New Hampshire Sta. Bul. 304 (1938), pp. 6, 32, 33*).—The progress results are briefly presented of investigations on methods for brush removal, by M. F. Abell; electric brooding, by W. T. Ackerman, T. B. Charles, A. E. Tepper, and G. M. Foulkrod; electric fences, by Ackerman; electric wax heating for use in the wax plucking of poultry; and pneumatic traction equipment.

[Agricultural engineering investigations at the South Dakota Station], R. L. Patty (*South Dakota Sta. Rpt. 1937, pp. 5–7*).—Progress results are briefly presented of investigations on rammed earth for farm building walls and protective coverings and life of steel fence posts.

Handbook of engineering practices, region 11 (*U. S. Dept. Agr., Soil Conserv. Serv., [1936], pp. [9]+99, pls. 75, figs. 34*).—This handbook, designed for the north Pacific coast area, includes chapters on field engineering, mechanical gully control, creek channel stabilization, surface run-off control, small earth fill dams, coastal sand dune control, fencing, range water supply development, field practices, drafting, miscellaneous, and tables.

Sprinkler irrigation in the humid sections of Oregon, F. E. Price (*Agr. Engin., 19 (1938), No. 4, pp. 161, 162, figs. 2*).—In a brief contribution from the Oregon Experiment Station an experiment on the sprinkler irrigation of pasture for dairy cows is described in which the irrigation was accompanied by increased butterfat production.

Geology and ground-water resources of south-central Nebraska, A. L. Lugn and L. K. Wenzel. (Coop. Univ. Nebr.). (*U. S. Geol. Survey, Water-Supply Paper 779 (1938), pp. VII+242, pls. 16, figs. 21*).—This investigation, which covered the period 1929–33, makes special reference to the Platte River Valley between Chapman and Gothenburg. For most parts of the area the ground-water supply was found to be ample for present needs, and evidence indicated that further development of irrigation with water pumped from wells would be possible in the Platte Valley and in some of the valleys of the smaller streams.

Water control investigations, B. S. Clayton and A. Daane. (Coop. U. S. D. A.). (*Florida Sta. Rpt. 1937, pp. 143–145*).—Progress results are briefly presented.

Effect of trade wastes on high- and low-temperature digestion, W. Rudolfs. (N. J. Expt. Stas.). (*Indus. and Engin. Chem., 29 (1937), No. 7, pp. 803, 804*).—The author finds that although certain organic wastes may cause a delay in digestion time and gas production, others have less effect; and "with acclimatization a nonodorous well-drained ripe sludge may be produced when from 10 to 20 percent organic wastes are added intermittently on the basis of the volatile matter in the fresh solids, and as much as 20 to 40 percent when added continuously either under mesophilic or thermophilic conditions. Odors tend to increase with organic and poisonous wastes. Thermophilic sludge is less sensitive to organic trade wastes than sludge digested under mesophilic conditions. Drainability of sludge produced from waste-sewage sludge mixtures is poorer. The composition of the gases produced is but slightly affected."

Terracing for soil and water conservation, C. L. Hamilton (*U. S. Dept. Agr., Farmers' Bul. 1789 (1938), pp. II+60, figs. 37*).—This supersedes Farmers' Bulletin 1669 (E. S. R., 66, p. 78). It compiles the best practical information now available on terrace construction and coordinates it with other recommended soil conservation practices.

Public Roads, [June 1938] (*U. S. Dept. Agr., Public Roads, 19 (1938), No. 4, pp. [2]+53–76+[2], figs. 10*).—This number of this periodical contains the current status of the various highway projects receiving Federal funds as of May 31, 1938, data on State motor fuel consumption and tax receipts for 1937, and the following reports, by reporters from the United States, to the International Road Congress which was held at The Hague, Netherlands, June 20–25, 1938: Progress in the Use of Cement in Road Surfaces, by V. L. Glover (pp. 53–57, 71, 72); Developments in Brick Pavements in the United States, by J. Jaster, Jr., G. F. Schlesinger, J. S. Crandell, and R. L. Phillips (pp. 58–60, 72); and Progress in the Preparation and Use on Roads of Tar, Asphalt, and Emulsions, by E. F. Kelley (pp. 61–71).

Farm tractor fuel trends, C. F. Frudden (*Agr. Engin., 19 (1938), No. 4, pp. 151, 152, 157, figs. 3*).—This paper is an attempt to analyze the tractor fuel situation in the light engine performance. Tractor fuels are classified as (1) tractor distillate suitable for operation in carburetor type engines, and having an end point of less than 600° F. and an octane number generally less than 35; (2) gasoline, often referred to as third grade, having an octane number of 50 to 60; and (3) gasoline, often referred to as regular, having an octane number of 68 to 70. It is observed that a compression ratio of about 4:1 is the highest practical ratio that can be used in the engine when burning zero octane fuel without experiencing serious knocking. If fuels of 35, 55, or 70 octane are to be used as the basis for the engine design, compression ratios of 4.3, 4.8, or 5.5 may be adopted with no greater tendency toward detonation than when using zero octane fuel in an engine of 4:1 compression ratio. It is shown in a general way how the fuel consumption in pounds per horsepower-hour decreases as the compression ratio is increased. The specific consumption at 4:1 is about 0.66 lb. per horsepower-hour, whereas at 5.5:1 it is only about 0.52.

To burn tractor distillate in a satisfactory manner a manifold temperature on the order of 200° is necessary, whereas when burning gasoline a temperature of 125° is sufficient for good operation.

The conclusion is drawn that engines must be made available for burning tractor distillate in territories where gasoline prices and gasoline taxes are high. Even when gasoline is untaxed, distillate should cost $25 less per year than gasoline.

If distillate is to be used the fuel should be purchased on a specification of 525° end point and a minimum of 35 octane. Fuels meeting these two specifications are almost universally available, and their use makes possible increased power as well as decreased consumption, as compared with zero octane fuels with 600° end points. At 1 ct. per gallon premium, 70 octane gasoline in an engine with 5.5 to 1 compression will cost no more for operation than 55 octane gasoline in an engine with 4.8 to 1 compression. It is poor economy to burn gasoline in an engine with the low compression required for tractor distillate, for not only is the fuel consumption high but horsepower is restricted. When conditions favor the use of gasoline, the engine should be built to burn gasoline most economically.

Technical characteristics of alcohol-gasoline blends (*Amer. Petrol. Inst., Motor Fuel Facts Ser. 1 (1938), pp. 15*).—The purpose of this article is to compare the properties of alcohol-gasoline blends with those of gasoline.

It is pointed out that alcohol-gasoline blends will show little change in mileage *but diminished performance without engine adjustments.* After engine adjustment similar performance is produced but with definitely reduced mileage. A very slight increase in maximum power output is produced but at the cost of considerably increased fuel consumption. There is less tendency to engine knock, at greater cost, than with other antiknock agents. These fuels have about the same starting quality but more danger of vapor lock. There is no important difference in engine maintenance costs, and no change in the hazard from carbon monoxide in exhaust gases. There is substantial possibility of trouble from separation in tanks and carburetors by water.

Energy requirements of swine and estimates of heat production and gaseous exchange for use in planning the ventilation of hog houses, H. H. MITCHELL and M. A. R. KELLEY. (Ill. Expt. Sta. and U. S. D. A.). (*Jour. Agr. Res.* [*U. S.*], *56* (*1938*), *No. 11, pp. 811–829, figs. 2*).—This paper reports an extension to swine of studies originally conducted with poultry (E. S. R., 70, p. 844). An analytical study was made of the energy requirements of swine for each of the various animal functions, as revealed by published information, and of an integration of these requirements for application to pigs of any particular age, weight, or condition. In this study the various animal functions were differentiated for separate analysis, the ultimate values established then being applied to any particular animal as needed. The general procedure was to estimate the energy requirements of swine by factoring out and assessing as accurately as possible all items contributing to energy expenditure or storage. These factors were then integrated for pigs of particular weights and conditions. Estimates of the net availability of the metabolizable energy of feed permitted the conversion of net energy into metabolizable energy values. From the latter, dry-matter requirements were estimated for definite, more or less typical rations. Summation of energy expenditures, via basal metabolism, muscular activity, and heat increment of feed, leads to an estimate of heat production. From this, estimates of the probable output of carbon dioxide and of the usual and maximal output of water vapor have been made. Complete estimates of this kind have been made for growing and fattening gilts and barrows, both according to American and English feeding practice, a pregnant gilt and a pregnant sow, and a lactating sow. Tentative estimates of critical temperatures have been made in each case. The findings are transposed into the form of basic data suitable to aid in the design of hog-house ventilation systems, and illustrations of their application are given.

Poultry house lighting and its influence on egg production and chicken growth, E. L. DAKAN (*Rural Electrif. Exch., n. ser., 1* (*1938*), *No. 1, pp. 13–15*).—Tests conducted at Ohio State University are briefly described and some of the more important results enumerated. The conclusion is that the influence of light on egg production is obtained through light absorption rather than through exercise and feed consumption at night. Tests showed that it is the long red rays which stimulate birds to reproductive activity. Evidence also was obtained that it is better to reflect the lights on the roost than on the floor. A 10-w and a 25-w lamp were too small, but a 40-w lamp produced as good results as a 100-w lamp. It appears that light does not influence growth but does influence sexual maturity. Experiments with old hens showed that lights suspended over the mash boxes doubled the egg production.

Electric heat for laying houses, H BERESFORD, J. B. RODGERS, and C. E. LAMPMAN (*C. R. E. A. News Letter* [*Chicago*], *No. 16* (*1937*), *pp. 18–24, figs. 6*).—Studies conducted by the Idaho Experiment Station in cooperation with the Idaho Committee on the Relation of Electricity to Agriculture are reported.

Two laying houses were used, and a 20- by 40-ft. gable-ceiling insulated house and the other a 20- by 90-ft. gable-roof straw-loft type. These houses were designated as the insulated house and long house, respectively.

The house in which the heating trials were conducted was 20 ft. deep. The building was divided into two 20-ft. pens with two double windows, two three-light cellar sashes under the droppings boards, and a door in each 20-ft. section. The north wall and the two ends of the long house were of double construction. The south wall had but a single thickness of siding nailed to the studding. The long house was originally designed as a straw-loft type of house, but a 2-in. layer of planer shavings was placed on the loft floor to insulate the ceiling. The long house was divided into nine 10-ft. pens, each pen having a window and a door in the front or south side. The middle pen was the furnace room and housed two underground furnaces, one for heating the west half and the other the east half of the building. The homemade electric heater was used in the insulated house.

The electric energy required to heat the insulated house to the same degree of comfort averaged for the two test periods only 35 percent of the energy required to heat the uninsulated house. Insulation and better construction no doubt were responsible for a large part of the difference in energy consumption, but the difference in the characteristics of the heaters is deemed a noteworthy factor. The average daily cost of electric energy at 3 ct. per kilowatt-hour for 2 yr. for the east half of the long house was 54.92 ct. and for the insulated house 18.98 ct. The cost of fuel for heating the east half of the long house with the underground furnace, coal at $12.50 per ton, averaged 31.6 ct. per day for the 2 yr., plus the cost of the attendant's time in firing and caring for the furnace, approximately 20 ct. per day.

Electric heat is deemed economically feasible in laying houses that are well built and well insulated, but is not recommended for poorly built and uninsulated houses, especially if cheap fuel is available. One of the chief advantages of electric heating is that it can be used for stand-by purposes.

The single-wafer type of thermostat was used in this investigation, and it was found necessary to polish the breaker points and reset the thermostat at intervals. To eliminate this trouble, it is recommended that a thermostat having sufficient capacity, preferably of the quick make and break type, be used to control the operation of the heaters.

In the opinion of the investigators a heater which circulates a relatively large volume of air with a lower rise in temperature is more desirable than one which circulates less air but raises the air to a higher temperature. The heater should be so designed that the heating coils never become hotter than a very faint red, preferably a black heat. Brief specifications for an electric heater for use in laying-house service based on results of this investigation call for a heater having a 1,000- to 1,500-w heating element equipped with a fan capable of circulating from 200 to 225 cu. ft. of air per minute, the operation of the heater to be controlled by a suitable thermostat. Such a heater, costing approximately $15, may be used in the laying house and also during the brooding season. A 1,000- to 1,250-w heater has sufficient capacity to warm the air in an insulated laying house 20 by 40 ft. in plan or in a house having a volume of approximately 5,000 cu. ft.

During the investigation it was found to be not only practical but desirable during extremely cold weather to diminish the quantity of air normally allowed for ventilation in order to conserve heat and electric energy. No bad effects were noted as a result of this system of management.

Electric brooding of chicks.—II, Heat requirements, W. T. ACKERMAN, T. B. CHARLES, G. M. FOULKROD, A. E. TEPPER, and R. C. DURGIN (*New Hampshire Sta. Bul. 303 (1938), pp. 31, figs. 15*).—Further experiments on electric brooding (E. S. R., 72, p. 546), were carried on in 1935, 1936, and 1937.

A summary of the 4 years' work indicated that electric brooding is practical and can be carried on under very severe climatic conditions without auxiliary heat or excessive mortality. High cost of application and lack of value from the insulation of walls and ceilings in houses used for electric brooding indicate its use to be unwarranted. Although the results of tests indicate that 1 in. of insulation enclosed in a waterproof bag and placed between two layers of wood is the point of diminishing returns from floor insulation, there is nothing to indicate that a double wood floor with a disk of 1-in. insulation board or its equivalent, properly waterproofed and slightly larger than the brooder, placed on the floor under the brooder will not be just as good as, or slightly better than, built-in insulation, and is less expensive. Labor and fuel costs differed very little between coal and electric brooders.

Under cold weather brooding, when litter changes are necessary it is recommended that the new supply be preheated before being placed in the pens. Increasing the square area and cubic contents of a brooder by the addition of extension rims and extra curtain, without changing the chick load or heating element, was of material benefit in stabilizing temperature control under the brooder. It is important to establish values for air exchange under the various types of electric brooders.

No difficulties in the management of chicks were encountered in a prolonged brooding period of 14 weeks as long as the cockerels were separated from pullets at 6 weeks of age, thus reducing the number of chicks approximately one-half and compensating for their increased size. The main irregularities in the temperature under brooders are obviously caused by brooder design features, floor drafts, and chick movement. It is recommended that no more than 200 baby chicks be placed under a 52-in. square electric brooder and not more than 225 chicks under a 56-in. round electric brooder. Loadings of baby chicks under electric brooders higher than those mentioned above were a direct cause of high mortality.

Modern methods in electric brooding, J. C. SCOTT (*Rural Electrif. Exch., n. ser., 1 (1938), No. 1, pp. 1–4, figs. 4*).—These methods are described briefly and some of the more important equipment, especially that electrically operated, is illustrated.

All-steel poultry houses, C. M. BICE and F. BOTELHO (*Hawaii Sta. Rpt. 1937, pp. 82, 83, fig. 1*).—The progress results of experiments with all-steel poultry houses for Hawaiian conditions are briefly presented.

Profits in electric milk coolers for dairyman, dealer, and power company, P. T. MONTFORT (*Rural Electrif. Exch., n. ser., 1 (1938), No. 2, pp. 25–28, figs. 4*).—In this brief contribution from the A. and M. College of Texas the results of service tests are presented and discussed.

[Storage investigations by the Massachusetts Station], C. I. GUNNESS, H. J. FRANKLIN, and C. R. FELLERS (*Massachusetts Sta. Bul. 347 (1938), pp. 8–10*).—Progress results are briefly presented for cranberries and apples.

AGRICULTURAL ECONOMICS

[Economic studies in Arizona] (*Arizona Sta. Rpt. 1937, pp. 11, 12, 13, 14*).—Results are briefly noted of studies of land productivity in southern Arizona, irrigation possibilities in the St. Johns area, and seasonal labor on Arizona irrigated farms.

[Investigations in agricultural economics by the Florida Station] (*Florida Sta. Rpt. 1937, pp. 30, 31–33*).—Included are a table by C. V. Noble, B. McKinley, and A. H. Spurlock showing for all the farms and the best 25 percent of the farms studied in 1925, 1928, 1934, and 1935, the acres operated, acres of cropland, capital invested, crop index, total farm receipts and expenses, labor and family income, the rate of return on capital; and tables by Z. Savage and Noble showing the costs and returns during the fiscal year 1935–36 for midseason orange groves from 12 to 14 yr. of age with comparisons with three previous seasons.

[Investigations in agricultural economics by the Iowa Station, 1936–37] (*Iowa Sta. Rpt. 1937, pts. 1, pp. 191–208, 209–211, 212–216, 216–219, 221–233, figs. 18; 2, p. 74*).—Results of studies not previously noted are reported as follows:

Part 1, findings by S. H. Thompson as to the number of hogs, cattle, and sheep sold by 27 cooperative livestock marketing associations in 1936 and 1937; reasons for profitable farm operations on the more profitable farms in northeastern Iowa and tables showing the average sales per farm of different kinds of livestock and the value of feed and pasture fed different kinds of livestock, by J. A. Hopkins, C. Malone, and C. Y. Cannon; findings by R. C. Bentley and T. W. Schultz as to the average value of Iowa farm lands and the relation of assessed to sales value, July 1934 through July 1936; some data by L. G. Allbaugh and R. K. Buck as to differences in number of cows and butterfat production shown by cow testing association and farm business records; some findings by Allbaugh as to the crop adjustments necessary in the different areas of the State to meet the recommendations in the central regional soil conservation program; statement by Schultz, W. W. Wilcox, and R. Schickele as to recommendations of county planning committees for crop adjustments, with comparisons with the acreages produced in 1929 and 1935; data by Schultz as to the farm income, prices, wages, taxes, borrowed capital, etc., in 1935 as compared with previous years and periods; some findings by Schultz as to the effect on Corn Belt agriculture of the structural changes in foreign trade; findings by M. G. Reid in a study of 9,764 income tax returns for 1934 as to the returns from farmers and nonfarmers; findings by Schultz as to the effects of reduced gross farm income on different types of expenditures; findings by G. S. Shepherd, M. D. Helser, and F. J. Beard as to factors affecting the grades and dressing percentages of Iowa hogs; findings by Allbaugh as to feed units produced per acre by different crops; and some findings by A. D. Oderkirk in a study of the methods and costs of assembling and processing poultry and poultry products in Iowa.

Part 2 includes findings as to the price spread for corn between surplus and deficit feed areas in 1924–25, 1927–28, and 1934–35, and the effects of cleaning corn on the price received.

[Investigations in agricultural economics and farm management by the Massachusetts Station, 1937] (*Massachusetts Sta. Bul. 347 (1938), pp. 6, 7, 8*).—Brief findings are included by C. R. Creek and D. C. Plastridge as to the increase in number of cow-days of grazing and in milk production resulting from seeding, fertilizing, and liming pastures; and by A. A. Brown, Creek, and J. E. Donley as to daily deliveries of milk, net price, methods and costs of transportation, etc., on the Springfield milk market.

[Investigations in agricultural economics by the Kentucky Station, 1937] (*Kentucky Sta. Rpt. 1937, pt. 1, pp. 11–13, 16, 26–29*).—Data and findings are included regarding (1) the history of cooperative marketing of tobacco in the State, price differentials between grades of tobacco, geographical varia-

tions in prices, factors influencing the prices of Burley tobacco, and the annual use of such tobacco; (2) the percentage of total cash income derived from the swine enterprise on Kentucky farms; (3) changes in land tenure, 1900–1930, the labor income of operators holding under different kinds of tenure in Logan County and the outer bluegrass area, the length of time and steps in attaining ownership by 115 farm operators in 5 central and southern counties, and the tenancy changes in central Kentucky from 1924 to 1937; (4) the sources of farm income on farms in Anderson, Mercer, Washington, and Garrard Counties; (5) the factors affecting the net returns from sheep; and (6) the costs and returns from 21 herds of hogs in Union County and 16 herds in the inner bluegrass area.

[Investigations in agricultural economics by the New Hampshire Station]. (Partly coop. U. S. D. A.). (*New Hampshire Sta. Bul. 304 (1938), pp. 6–8*).—Brief findings are included as to (1) the rates charged by independent and distributor truckers of milk, and the effects of length of route, size of load, and type of road on rates, by A. MacLeod; (2) possible markets for small fruits, by L. A. Dougherty; and (3) numbers of farms of different types participating in the soil conservation program and the farming practices being carried on under the program, by H. C. Woodworth, E. Rauchenstein, and V. H. Smith.

[Investigations in agricultural economics by the Rhode Island Station], (Coop. U. S. D. A. et al.). (*Rhode Island Sta. Rpt. [1937], pp. 2–6*).—Included in addition to results previously noted are (1) some findings regarding relationships between various quality factors and egg prices; (2) some conclusions regarding conditions necessary for a satisfactory income on poultry farms with 200 or more hens; (3) some findings regarding farm taxes and farm real estate transfers; and (4) some data as to supply of and demand for class 1 milk in the Newport and Providence markets.

Proposals of Government aid to agricultural settlement during the depression of 1873–1879, A. V. House, Jr. (*Agr. Hist., 12 (1938), No. 1, pp. 46–66*).—The legislation proposed to encourage agricultural settlement during the period is reviewed.

Foreign Agriculture, [May–June 1938] (*U. S. Dept. Agr., Bur. Agr. Econ., Foreign Agr., 2 (1938), Nos. 5, pp. 211–246; 6, pp. 247–302, fig. 1*).—No. 5 includes articles on Recent Developments in Swedish Agricultural Policy, by L. V. Steere (pp. 213–234), and Consolidation of Scattered Farm Holdings in Germany, by H. Richter (pp. 235–242), and notes on recent developments in foreign agricultural policy as follows: Turkey to aid institutions handling farm products, Finland stresses colonization and land settlement, home industries in Norwegian rural life, crop diversification urged in Cuba, and Jamaica encourages crop diversification. No. 6 includes articles on Farm Labor and Social Legislation in England, by A. T. Murray (pp. 249–266), and Agriculture in Peru, by E. P. Keeler and C. H. Barber (pp. 267–298), and notes on recent developments in foreign agricultural policy as follows: Germany plans "reconstruction" of Austrian agriculture, fixed prices and reduced acreage for Czechoslovak beet sugar industry, wheat growers in Laguna district of Mexico organize crop insurance association, and Colombia plans agricultural expansion.

Agriculture on the Flathead Irrigation project, P. L. Slagsvold and J. D. Mathews. (Coop. W. P. A.). (*Montana Sta. Bul. 357 (1938), pp. 23, figs. 19*).—"This is a preliminary report of the fundamental factors affecting the development and present status of agriculture on the Flathead project, and facts are given which may aid in molding a sound agricultural policy for the area." Data are included as to soils, topography, climate, number and area of farms, land tenure and use, crop yields, livestock production, water costs, taxes, farm investments, gross income, etc.

Types of farming in Missouri, C. H. Hammar, W. J. Roth, and O. R. Johnson. (Coop. U. S. D. A.). (*Missouri Sta. Res. Bul. 284 (1938), pp. 100, figs. 41*).—The present (1929) and past land use, acreage of land in different crops, and numbers of different kinds of livestock on farms are discussed and shown in maps. The forces influencing the farming of the State—topography, soils, climate, costs of land, labor, prices, markets, transportation, etc.—and the types of farming in the State are also discussed. On the basis of these data the State is divided into seven major type-of-farming areas with subdivisions, all of which are described and shown on maps.

The increase in number of farms from 1930 to 1936 in six townships of Ohio, M. L. Predmore and R. H. Baker. (Coop. U. S. D. A. et al.). (*Ohio State Univ., Dept. Rural Econ. Mimeogr. Bul. 104 (1937), pp. VI+25, figs. 2*).—This study showed an increase, 1930–35, in the number of farms in the six townships of 5.6 percent as compared with 16.7 percent as shown by the U. S. Census. The greatest increase was in a poor land-river commerce area and the least in a good land area. The new farms were predominantly part-time farms. The greatest promise for success was in the good farm area and the best outlook for new part-time farms in the industrial area. Most of the new farmers were middle-aged city people, and most of them had agricultural experience. In the poorer agricultural areas the new farms have added materially to relief costs, and in no case were they numerous enough to assume a significant portion of the tax base of the township or county.

Types of tenant areas in Tennessee, C. E. Allred and E. E. Briner (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog. 73 (1938), pp. II+46, figs. 14*).—The trends of tenancy 1880–1935, the distribution by tenure and color, the size and value of farms and the value of implements and machinery by tenure, the types of tenant areas in Tennessee, and the several areas are described. The factors associated with the types of tenant areas are discussed.

Costs and returns in producing potatoes in Aroostook County, Maine, W. E. Schrumpf (*Maine Sta. Bul. 390 (1937), pp. 163–231, figs. 5*).—This bulletin is based on data for the years 1928–30, inclusive, obtained by the survey method from 101 farms in the Presque Isle area, 43 farms in the Houlton area producing table potatoes, and 21 farms producing certified seed potatoes. An analysis is made of the costs of producing, harvesting, storing, and selling potatoes in each of the three areas; of the relations of cost of growing and harvesting to acreage and yield rate, of storage cost to amount stored, and of cost of selling to distance from shipping point and amount sold; and of the returns from potato production.

The average crop acreages were 102, 85, and 130, and the acreages in potatoes 43, 30, and 52, respectively, in the three areas. The labor incomes per farm were $689, $702, and $2,134, and returns on capital invested 2.6, 2, and 6.4 percent, respectively, in the areas. Costs per barrel were 92 ct., $1.03, and 97 ct., and for harvesting 15.9, 17, and 15.6 ct. in the three areas. Average costs of growing and harvesting decreased from $145 per acre on farms averaging 15 acres of potatoes to $121 on those averaging 88 acres. The costs per barrel decreased from $1.61 with an average yield of 73 bbl. to 92 ct. with an average yield of 150 bbl. Cost of storing per barrel removed from storage averaged 39 ct. in the Presque Isle area, 38 ct. in the Houlton area, and 42 ct. in the certified seed farms. Costs of selling per barrel averaged 12, 13, and 19 ct. in the respective areas. The net returns per barrel were 35, 31, and 49 ct., and the returns per hour of man labor 97 ct., 77 ct., and $1.09 in the respective areas. With at least one of the three factors—size of business, yield of potatoes per acre, and labor efficiency—above the average, net returns per acre were from 10 to 21 percent above the average; with at least two factors above the average net returns were from 14 to 36 percent

above the average; and with all three factors above the average net returns were from 97 to 175 percent above the average.

Analysis of the organization and factors influencing the returns on 194 small tobacco farms in Puerto Rico, 1935–1936, J. J. Serrallés, Jr., R. C. Torres, and F. J. Juliá (*Puerto Rico Col. Sta. Bul. 46 (1938), pp. 50, pl. 1, figs. 6*).—This study was limited to 194 farms of 50 cuerdas (48.56 acres), with not more than 10 cuerdas in tobacco.

The average size of farms was 14.4 cuerdas, of which 6.6 was cropped. The total area in crops, including intercropping and double cropping, was 10.3 cuerdas of which 2.73 cuerdas was in tobacco. The average farm capital was $859, of which 69 percent was in land. The average yield of tobacco was 790 lb. per cuerda. Crop sales averaged $312 per farm, of which 90.8 percent was from tobacco. The average labor income per farm after allowing 8 percent on the investment was $107, and the average value of farm privileges was $175. The average labor income per farm increased from $28 on farms with 1 cuerda or less of tobacco to $327 for those with over 5 cuerdas in tobacco. A yield of 600 lb. or less of tobacco per cuerda gave an average labor income of $18 per cuerda as compared with $232 where the yields were 910 lb. per cuerda. The average farm value of tobacco varied from 7 to 20 ct. per pound. Farms receiving less than 12 ct. received an average labor income of $8, while those receiving above 15 ct. averaged $194. On the farms producing less than 400 lb. of tobacco per man equivalent the labor income averaged −$8 as compared with $323 where over 1,300 lb. of tobacco was produced per man. Farmers selling their tobacco through local cooperatives had higher labor incomes than those selling through lien holders, country stores, or itinerant buyers. The highest labor income was on 8 farms having the number of cuerdas in farm, pounds of tobacco produced per man, crop index, amount of fertilizer used, and percentage of production sold above the average.

Trends of yield in major wheat regions since 1885.—I, General considerations and rising trends, M. K. Bennett (*Wheat Studies, Food Res. Inst. [Stanford Univ.], 14 (1937), No. 3, pp. [2]+69–102, figs. 10*).—This study is the first of two which constitute a moderately comprehensive survey of the trends in average yield per acre in most of the regions outside of the Union of Soviet Socialist Republics, China, Turkey, and neighboring Asiatic countries, made for the purpose of describing the trends and explaining the diversity of trends in the 14 countries surveyed. This publication deals with the 5 regions in which the trends were upward. "Six types of influence are distinguished: Inaccuracies in basic statistics; geographical shifts of wheat acreage within the region; the initial level of yield per acre; changes in the environment of the wheat plant due to natural causes (pests, weather); man-made changes in this environment, chiefly disease controls, rotations, fertilizers, mechanical devices, and regulation of water supply; and changes in types and varieties of wheat."

In the five regions in which trends were upward the major part of the trend increase in yield "seems assignable to man-made improvement of agricultural technics." Wider use of fertilizers and the development and spread of improved wheat varieties seem to have been the dominating factors.

Price effects of Canadian wheat marketing, H. Working (*Wheat Studies, Food Res. Inst. [Stanford Univ.], 14 (1937), No. 2, pp. [2]+37–68, figs. 10*).—The general relations of marketing to prices are discussed in sections on seasonal price tendencies, supply and demand influences affecting price relations, and changes in price ratios within seasons. Using daily data from the Winnipeg market, August 1922 to November 1937, the average effects of rate of country marketing on futures prices are analyzed and discussed in sections on

specific effects of rate of marketing; seasonal tendencies in deliveries, prices, and spreads; and tendencies by marketing periods. The recent changes in price effects of country marketing are covered in sections on price effects of sustained changes in rate of delivery and of day-to-day variations in deliveries, and possible causes of changing sensitiveness of prices.

Despite extremely rapid marketing of western Canadian wheat after harvest, the prices of such wheat have tended to be depressed less after harvest than the prices of British domestic wheat. There seemed to be no tendency for Canadian wheat to be relatively underpriced in the British market during the first half of the crop year when Canadian farm marketings are heaviest. "The price of the Winnipeg December future has declined slightly over 4 ct. relative to Liverpool, on the average, from early August to late October. This decline seems attributable less to hedging pressure than to necessities of the export trade. The Winnipeg price in early August has tended to stand too high relative to Liverpool to permit an adequate rate of exportation. Changes in the rate of country delivery of wheat and the associated changes in volume of hedging have been accompanied, nevertheless, by measurable changes in the Winnipeg price. The price has responded more definitely to sustained changes in the rate of farm marketing than to temporary variations; and the response, though still small, was relatively much larger in 1933 to 1936 than in earlier years. Causal connections are difficult to establish, but consideration of associated events suggests interesting possible explanations of the changes in sensitiveness of Winnipeg prices to hedging pressure."

The extension of credit to the livestock industry, H. J. Jordan (*Diss., Northwestern Univ., Evanston, Ill., 1936, pp. [1]+XVII+439, figs. 24*).—In this doctorate dissertation, the major purpose was "to discover why the Government extended credit to the livestock industry from 1921 to 1936 and to examine the evidence pointing toward further expansion or contraction in the immediate future." Three sources of information were used in the study—library materials and interviews with and questionnaires returned by bankers, bank examiners, Farm Credit officials, officials of livestock loan companies, commission men, stockmen, railroad agricultural agents, insurance company executives, etc. The economic position of the livestock industry, the characteristics of the demand for livestock credit, the permanent and temporary sources of private and of governmental credit, and the costs of credit are analyzed and discussed.

Contract feeding and pasturing of lambs and cattle, C. G. Randell (*Farm Credit Admin. [U. S.], Coop. Div., Bul. 15 (1937), pp. VI+113, figs. 17*).—Data regarding lamb feeding operations in 1933–34 and 1934–35 were obtained for the Red River Valley of North Dakota and Minnesota, sections of the central Corn Belt in Iowa, Minnesota, South Dakota, and Illinois, and the wheat pasture areas of western Kansas and Oklahoma. The development and growth of contract feeding is described. The results of lamb-feeding operations in the three areas and of cattle feeding in the Corn Belt area, the attitudes of growers and feeders toward contract feeding, the opportunities for improvement in contract feeding methods and rations, and employment of supervising agents are charts are included and discussed showing the relationship of the number of discussed. Appendixes include contracts and forms used in contract feeding.

Montana cattle shipments: Sources, destinations, and character of Montana's cattle shipments, P. S. Eckert and P. L. Slagsvold. (Coop. W. P. A.). (*Montana Sta. Bul. 358 (1938), pp. 44, figs. 20*).—Tables, maps, and charts are included and discussed showing the relationship of the number of beef cattle, 1885–1936, and shipments out of the State, the sources by counties and destination of shipments during the period 1929–35, different kinds of

cattle, the influence of transportation facilities on market destinations, the proportion of cattle of different kinds shipped to different markets, the seasonal movement of shipments, and the importance of Montana shipments in the central markets.

Hogs in Georgia, with special reference to production in the peanut area, O. Steanson, Z. A. Massey, and J. C. Elrod. (Coop. U. S. D. A.). (*Georgia Sta. Bul. 198 (1938), pp. 44, figs. 16*).—The production and trends in production of hogs in the State, the feed resources, market facilities, weights and prices, grades, time of marketing, production practices, etc., are discussed. Three suggested systems of production are outlined.

Studies of the market quality of eggs from 109 farms in southeastern Illinois, H. H. Alp, R. C. Ashby, and L. E. Card (*Illinois Sta. Bul. 441 (1938), pp. 397–411, figs. 2*).—This study included 586 cases of eggs assembled from 109 farms in 9 counties in southeastern Illinois during June and July 1936 and shipped to New York, 62 cases by truck and 524 by rail. Three of the rail shipments were in iced cars and 2 in cars not iced. All eggs were closely inspected as to grade, weight, and general condition of pack before shipment and upon arrival in New York City. Some data are also included for shipments from one county in 1935 and for some eggs shipped in October 1936.

Practically no difference in quality was found between the eggs going by rail and by truck or between eggs shipped in iced cars and noniced cars where the eggs were precooled. The deterioration in quality was about one grade in the case of shipments held in storage 138 and 119 days in New York City. Large eggs graded better than lighter eggs both before and after shipment. All the eggs declined in weight as the temperature during the shipping period increased, but the decline in quality was not great. Market quality was affected especially by cooling, range practices, and size and character of the flock. Storage before shipment with ample moisture, confinement (or limited range) for flocks, and large flocks gave the better quality eggs.

Factors affecting prices at two Connecticut egg auctions, E. A. Perregaux, B. C. Wright, and R. G. Bressler, Jr. ([*Connecticut*] *Storrs Sta. Bul. 225 (1938), pp. 24, figs. 5*).—The history, growth, sources of supply, methods of transportation, methods of conducting the auctions, inspection and grades, types of buyers, etc., of the two auctions, the Connecticut Farmers' Cooperative Auction at Hartford and the Hamden Cooperative Poultry Auction, are described. Using the data available to buyers, a statistical analysis is made of the relations of weight per case, grade, and color of shell to prices in July and October 1935 and January and April 1936. The ranges of the coefficients of partial correlation and standard errors for the 4 mo. were: Weight, Hartford from 0.899 to 0.983 and 0.0025 to 0.012, and Hamden from 0.743 to 0.966 and 0.0058 to 0.0077 for Hartford and from 0.869 to 0.98 and 0.0034 to 0.0198 for Hamden. from 0.169 to 0.436 and 0.0651 to 0.09; color, Hartford from 0.00 to 0.105 and 0.06 to 0.08 and Hamden from 0.00 to 0.112 and 0.0 to 0.1 The coefficient of multiple correlations and standard errors ranged from 0.94 to 0.986 and 0.002 to 0.0077 for Hartford and from 0.869 to 0.98 and 0.0034 to 0.0198 for Hamden. Each additional pound in gross weight of a 30-doz. case brought an average increase of from 14 to 36.8 ct. per case at Hartford and from 13.9 to 43.2 ct. at Hamden. The prices at Hartford for the Special grade eggs during the 4 mo. studied ranged from 18.6 to 38.7 ct. per case higher than the Extra grade, which ranged from 10.5 to 22.2 ct. above the Connecticut Gathered grade. At Hamden the premiums were from 4.5 to 58.5 ct. and from 43.5 ct. to $1.275, respectively. Shell color had only a slight effect on prices.

Summary report on cost of distributing milk in the Boston market (*Boston: Mass. Milk Control Bd., 1936, pp. [6]+XX+204, [pls. 21]*).—This is an analysis of the cost of distributing milk and cream in the Boston market, prepared for the Massachusetts Milk Control Board by C. F. Rittenhouse and Company, certified public accountants. The study was begun in May 1935 and included a survey of milk dealers and a retail food stores survey. Included are a general statement of results (pp. 1–27), summary reports on the dealer survey (pp. 31–118) and on the retail food stores survey (pp. 121–181), and a section on unit cost and small enterprises (pp. 185–189). Appendixes include an explanation of various functional classifications and instructions for compiling daily distribution of clerk time on the functional chart and for diagrammatical analysis of sales used in the survey of the retail stores.

An economic study of the costs of selling and delivering milk in the New York market, C. Blanford (*[New York] Cornell Sta. Bul. 686 (1938), pp. 60, figs. 7*).—Cost records for October 1933 were obtained from 11 retail sales branches with 775 retail or mixed routes and 33 wholesale routes and from 7 wholesale distribution branches with 111 routes. For the retail routes an analysis is made of the kinds of products delivered, variations in total costs, types of expenditures, factors affecting costs of branch operation, route costs, size of load, etc. For the wholesale branches an analysis is made of the types of costs, factors affecting branch operation, size of load, etc.

On the retail routes deliveries averaged 329 qt. per route per day with a total cost of 4.87 ct. per quart, of which 68 percent was for personal services, 12 percent for property expenses, 11 percent for purchased services and supplies, and 9 percent for general expenses. Size of route load, which varied from 135 to 606 qt., daily, volume of business of the branch, which varied from 2,889 to 60,029 qt. per day, and valuation of property, which varied from $1.81 to $31.97 per quart of sales were the factors primarily responsible for differences in the costs. Most of the wholesale routes and branches were relatively inefficient due to the small size. Delivery and selling costs varied from 1.99 to 3.65 ct. per quart, averaging 3.1 ct. Size of load had the greatest effect on cost. Route returns averaged 4.8 percent of the sales on the retail routes and 6.1 percent on the wholesale routes. Of the retail sales 64.6 percent were from byproducts—buttermilk, butter, eggs, etc. Among methods suggested for reducing retail costs were a differential in price based on size of purchase, discontinuance of doorstep deliveries in sections where most of the milk is delivered through stores, deliveries only on alternate days, use of helpers in the more intensive sale areas, and restriction of the number of dealers. Methods suggested for wholesale deliveries included discounts for volume purchases, restriction of the number of dealers, discontinuance of free ice to customers, stricter credit control, and the use of paper bottles.

Seasonal changes in market milk production in Pennsylvania: The relation of month-to-month fluctuations in milk sales to prices received by farmers, F. F. Lininger and C. W. Pierce (*Pennsylvania Sta. Bul. 358 (1938), pp. [2]+32, figs. 15*).—The changes in the seasonal production of milk in the Pittsburgh, New York City, and Philadelphia milksheds of the State and the relation of seasonal production to market sales for fluid use and the impact of this relationship on average prices received by farmers when the milk is sold according to classes—use basis—are discussed.

Class 1 sales approximate sales for fluid use and were rather constant from month to month. Farm production varied widely, usually being highest in June and lowest in November. Prices for milk for fluid use are higher than for other uses, and the average price paid producers depends largely on the supply

sold for fluid uses. Production by direct shippers was less variable than that of producers delivering to country plants. A trend toward uneven production was found to widen the milkshed, to increase the cost of marketing by requiring additional investments in plants, equipment, and trucking facilities, and to increase seasonal fluctuations in prices paid producers. The present price system in Pennsylvania favors uneven production, and producers are demanding a change in price policies. Two plans are being advocated—(1) fluid milk sales to be allocated at the beginning of each year in proportion to marketing the preceding year, and (2) the lowering of prices in spring and summer and raising them in the fall and winter.

The consumption of dairy products in Burlington, Vermont, 1935–36, H. B. ELLENBERGER and J. T. STEARNS (*Vermont Sta. Bul. 433 (1938), pp. 39*).—By a house-to-house survey covering all parts of the city data were obtained from 3,616 families including 15,258 persons, or about three-fifths of the population. Tables are included showing percentages of families purchasing different amounts of fresh milk per day, the frequency of drinking and per capita amounts of milk drunk by age groups and nationalities, reasons for drinking or not drinking milk by age groups, effects of family income on the purchase and use of milk, size and make-up of families on milk usage, grades of milk purchased and reasons therefor, prices paid for milk and its effect on purchases, use of canned milk, cream, butter, and cheese per capita, by nationalities, and income groups, etc.

Annual per capita consumption of fresh milk averaged 96.6 qt. for families on relief, 143.5 for those with incomes of from $10 to $20 per week, and 194.6 qt. for those with weekly incomes of from $30 to $50. It varied from 127.4 qt. for Italian families to 193.1 for Hebrew families, being 170.9 qt. for native white families. The average milk equivalent for fresh milk, canned milk, cream, butter, and cheese was 1,189 lb., ranging from 697 for families on relief to 1,009 for families with weekly incomes of from $10 to $20 and 1,340 lb. for families with average weekly incomes of from $30 to $50. It ranged from 843 lb. for Italian families to 1,376 lb. for English-Scotch families, being 1,228 lb. for native white families. The average annual consumption of all families was fresh milk 168 qt., canned milk 15.6 tall cans, cream 4.44 qt., butter 29.8 lb., and cheese 6.88 lb.

A decade of Michigan cooperative elevators, 1925 to 1935, W. O. HEDRICK (*Michigan Sta. Spec. Bul. 291 (1938), pp. 95*).—The 98 cooperative elevators were visited by field men during 1936 and data obtained as to organization, membership, volume of business, services to members and nonmembers, capital, assets, etc. Comparisons are made with the elevators covered by the previous study by Clayton and Horner (E. S. R., 60, p. 187) still active. Experimentation with cooperation in the State during the decade and the laws under which the existing elevator associations are organized are described.

Of the 128 elevator associations in 1925, 30 had disappeared by 1935 but 2 new ones were active. Managerial incompetency, credit administration, inadequate capital, and accountancy shortcomings were the leading causes given for the insolvency of those disappearing. The average clientele per elevator in 68 identical elevators in 1935 was 531 persons as compared with 440 in 1925. Losses were shown by 33 of the elevators. The number of persons served per elevator ranged from 130 to 2,765 in 1935. The trade areas served in 1935 averaged less than half the size of those in 1925. Nonmembers exceeded the enrolled members by 35 percent in 1925 and 105 percent in 1935. Members in 1935 constituted 50 percent or more of the clientele in only 21 of 95 of the elevators studied. Sales in 1935 (97 associations) of supplies totaled $6,211,433 and of products $6,143,564. The supplies business was largely a growth during the decade. Total business (85

elevators) dropped approximately 19 percent during the decade. Amounts of capital stock issued were increased during the decade in 38 and decreased in 41 associations of the 80 studied, the total decrease being approximately $17,400. Fixed assets (83 identical associations) increased nearly $957,000, there being increases for 62 associations and decreases for 21. Although the total loss in membership (30 associations) from 1925 to 1936 was only 641, fully 75 percent of the associations had smaller memberships in 1935. In the 98 associations, 14,572 members were producers, 1,598 nonproducers, and 482 nonresidents. From 1930 to 1935, inclusive, the average annual dividends of 5 percent or more were paid by 70 of the associations studied. Patronage dividends were provided for by 61 of the associations and paid by 27. All but 30 of the associations had a 90 percent farmer membership, all but 5 had a one-man one-vote plan of control, fully two-thirds served more nonmembers than members, and only 18 granted patronage dividends to the entire clientele.

Cotton compressing in Tennessee and United States, C. E. Allred and B. D. Raskopf (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog. 71 (1938), pp. IV+41, figs. 6*).—"This study deals with the history of compresses, location and volume of business done, results secured, how the presses operate, their value to farmers and the community, and finally a brief discussion of the compresses of other States."

The meaning, possibilities, and limitations of cooperative marketing, E. F. Dummeier (*Washington Sta. Pop. Bul. 154 (1938), pp. 24*).—This is a popular bulletin discussing the meaning and significance of marketing services, cooperative marketing, types of organization for cooperative marketing, the importance of such marketing in the United States and the State of Washington and how it can benefit Washington farmers, some of the benefits claimed for such marketing which are not possible, and the ways to success in cooperative marketing.

Organization and operation of Marsh Market in Baltimore and proposed improvements, G. P. Lachar (*Maryland Sta. Bul. 415 (1938), pp. 207–237, figs. 9*).—This study of Marsh Market, a farmers wholesale market operating throughout the year and receiving practically all of its supplies by motortruck, is based on data for 1934 obtained from commission brokers and interviews with truckers and growers. The development of the market, its area, capacity, facilities, ownership, and control are described. The marketing practices and regulations are discussed. The receipts, distribution, and facilities of the market are analyzed, and recommendations made as to the expansion of the market, the facilities that should be provided, and the regulations necessary in its operation. See also a previous notes (E. S. R., 78, p. 120).

Crops and markets, [May–June 1938] (*U. S. Dept. Agr., Crops and Markets, 15 (1938), Nos. 5, pp. 89–108, figs. 2; 6, pp. 109–128, figs. 2*).—Included are crop and market reports of the usual types. No. 6 contains tables showing for a number of years the number of persons on farms in the United States and the increases and decreases due to births, deaths, and moving to and from cities, towns, and villages.

RURAL SOCIOLOGY

[Investigations in rural sociology in Iowa] (*Iowa Sta. Rpt. 1937, pt. 1, pp. 208, 209, 211, 212, 219–221*).—Brief progress results are reported on the following investigations: Anticipated and actual yearly income and expenditures of Resettlement Administration farm families in 1936, by M. G. Reid; and relief given by public and private agencies in rural and town counties, mobility of

the rural population, an estimate of the farm population and of farm population movements, and old age assistance, all by R. E. Wakeley.

[Investigations in rural sociology in Rhode Island] (*Rhode Island Sta. Rpt. [1937], pp. 36–38*).—Brief results are reported on older rural youth and the characteristics and occupations of 1,100 part-time Rhode Island farmers.

Rural sociology, W. F. Kumlien (*South Dakota Sta. Rpt. 1937, pp. 33–36*).—Results are noted of studies on the relief situation, immigrant settlements and social organization, and rural population mobility in South Dakota.

Some notes on rural social research in the South, B. O. Williams (*Rural Sociol., 2 (1937), No. 3, pp. 323–329*).—The South is deemed woefully short on concrete, factual information concerning its social machinery. It is confronted by many problems, among them tenancy, soil wastage, a biracial population, and illiteracy. The author calls attention to the fact that southern educational institutions are in a state of transition and points out the various agencies conducting or supporting research, such as the agricultural experiment stations, the Tennessee Valley Authority, and the Works Progress Administration. Some of the limitations to education and research in the economc and social fields are summarized as follows:

Most teachers in the colleges and universities of the South are overburdened with heavy teaching loads and have little time for research. Despite longer hours, salaries are considerably less than in other areas. Additional and better trained staff members and investigators are greatly needed in the social sciences in the rural South. Library facilities for research are very inadequate in most institutions, and some plan is needed for sabbatical leaves and shorter leaves of absence for advanced study. Research activities in the social sciences throughout the South should be coordinated, and there is need for a well-financed medium for the publication of timely research findings as well as additional funds for the publication of station research. Few States in the South have made substantial appropriations for research. Federal funds are definitely limited. The problem is made more serious since an unequal distribution of age-groups makes the South a training ground for an excessively large proportion of the young people of the Nation.

***Human and physical resources of Tennessee.*—XXII, Homes,** C. E. Allred, S. W. Atkins, and W. E. Hendrix (*Tenn. Agr. Col., Agr. Econ. and Rural Sociol. Dept. Monog. 70 (1938), pp. [1]+IV+337–360, figs. 6*).—There were 600,625 homes in the State in 1930, averaging 4.3 persons each. The number of families per 1,000 population has increased each decade since 1850. In 1930 Tennessee ranked fortieth among the States with an average value of $602 per home. Dwellings on dairy farms averaged $1,550, compared with $398 for those on cotton farms. A farm home survey in 9 representative counties in 1934 showed that 89 percent of the farm dwellings were frame, 9.3 percent log, and 1 percent brick, and about one-third were in good condition. The average value of urban homes owned by the occupants was $3,850 in 1930, compared with $1,657 for rural nonfarm homes. Monthly rentals of homes average approximately $17 in urban areas and less than $10 in rural nonfarm areas. The percentage of urban home ownership is 38.8, compared with 39.3 percent in the East South Central States and 42.8 percent in the United States. Of the rural nonfarm group 44.2 percent own their homes, and of the farm group 53.8 percent, compared with an average in the South as a whole of 46.5 percent and 57.9 percent in the United States. The trend in number of farm tenants has been upward in both the South and the United States, but the percentage did not change from 1930 to 1935 in Tennessee. The State is increasing more rapidly than most southern States in the percentage of homes equipped with modern conveniences.

Rich land—poor people, M. R. WHITE, D. ENSMINGER, and C. L. GREGORY (*U. S. Dept. Agr., Farm Security Admin., Region 3, Res. Rpt., 1 (1938), pp. [2]+62, figs. 32*).—This is a study of social and economic conditions in southeast Missouri. Included are discussions of the natural resources, the settlement of the region and the composition and characteristics of its population, the agriculture and the farm tenure system, how the people live, and their community organization.

Part-time farming in Virginia, B. L. and R. B. HUMMEL (*Blacksburg: Va. Polytech. Inst., 1938, pp. [3]+89+[16], figs. 2*).—The average part-time farmer was 42 yr. of age and had 16 yr. of farming experience and 7 yr. of schooling. The white part-time farming family averaged 4.3 persons, living in a home of 5.4 rooms in good repair. Sixty-six percent of the families owned their homes and 2.4 acres of land, which was the sample average farm. The family head earned $835 in industrial employment at which he worked almost full time (234 days). The family obtained $180 cash equivalent from the part-time farm, chiefly the products of the home garden of 0.68 acre. For those who reported flocks, poultry was second in importance. Meat and dairy products were also valuable contributions, but only 55 percent of the white operators kept hogs, 46 percent cows, and 69 percent chickens. Almost the entire labor of the average farm was performed by the part-time operator and his family.

The full-time industrial worker was found younger (37 yr.) and had a smaller family (3.8 persons). His education was slightly better and his average industrial income somewhat higher, but his gross annual income was below that of the part-time farmer.

The part-time farmer enjoyed lower costs of living, greater gross annual income, greater freedom, and more healthful surroundings. He was more interested in organizational and community activities. The chief advantages in full-time industrial employment were more available household conveniences and shorter distances to place of employment, amusement centers, and markets.

Sociological phases of the farm labor problem, C. F. KRAENZEL (*West. Farm Econ. Assoc. Proc., 10 (1937), pp. 98–101*).—The author draws upon California data to support the proposition that the farm labor problem is most prevalent in areas where specialized agriculture of a highly commercialized nature prevails. "More than one-third of all large-scale farms in the entire country were located in California in 1930. Associated with this is the need for seasonal and migratory farm labor. The average cash expenditure for farm labor per farm was $1,438 in California in 1929, compared with $363 for the Nation as a whole and $323 for Iowa. According to the 1930 Census, paid farm laborers constituted 57 percent of all persons gainfully employed in agriculture in California, whereas the corresponding proportion for the Nation as a whole was only 26 percent, while for Iowa it was 27 percent." While for the Nation as a whole 64 percent of the paid farm laborers resided on the farm, California had only 44 and Iowa 77 percent.

Population research, I. G. DAVIS (*Jour. Farm Econ., 19 (1937), No. 3, p. 836*).—The Advisory Committee of the Social Science Research Council feels the advisability of redefining the research needs for large elements in our rural population which are noncommercial and more or less handicapped by low and precarious incomes. "This group of population is to a large extent the seedbed for the American people in that fertility rates of 1930 were between 150 to 175 percent of reproduction as contrasted with 75 percent for the large cities, 95 percent for the towns, and 125 percent for the commercialized farmers. A redirection of research concerning the livelihood and needs of these people and their role in American culture may be needed as follows: (1) In the form of new projects,

(2) in the form of continuing previous researches and redirecting them, [and] (3) in the inclusion of their problems in specialized studies of the physical and economic characteristics of American agriculture. Former general assumptions concerning these people may represent unrealistic approaches to their problems. A realistic reappraisal of the problems of these people is needed in terms of their human contributions to American life and in terms of their needs for which 'remedies' and 'improvements' can be realized."

Notes on statistical mapping, with special reference to the mapping of population phenomena, J. K. Wright, L. A. Jones, L. Stone, and T. W. Birch (*New York: Amer. Geogr. Soc.; Washington, D. C.: Population Assoc. Amer., 1938, pp. [3]+37, figs. 3*).—The material presented deals with the mapping of population phenomena and other data on the basis of statistical information. It explains some of the main problems in this field and attempts to classify population maps in terms of methods employed in their construction.

Family life studies (*Nebraska Sta. Rpt. [1937], pp. 34, 35*).—Correlations between home environmental factors and self-reliance and other aspects of character and personality in young people in farm, small-town, and city groups are noted.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

[*Proceedings* of the fifty-first annual convention of the Association of Land-Grant Colleges and Universities], edited by W. L. Slate (*Assoc. Land-Grant Cols. and Univs. Proc., 51 (1938), pp. IV±374*).—This is the report of the convention held at Washington, D. C., November 14–17, 1937, and previously discussed (E. S. R., 78, pp. 1, 144, 145). Included are the papers and discussions presented in the general sessions and in the sections on agriculture, resident instruction, extension work, experiment station work, engineering, and home economics; the minutes of the executive body, reports of committees, lists of officers and committees for the succeeding year, etc. Also included are the addresses at the pioneer's program, the wreath-laying ceremony at the Lincoln Memorial, the Lincoln Memorial, the Monticello, and the Mount Vernon programs, and the dedication of the Wilson and Knapp Memorial Arches, delivered in connection with the celebration of the seventy-fifth anniversaries of the passage of the First Morrill Act and of the establishment of the U. S. Department of Agriculture, and the fiftieth anniversary of the passage of the Hatch Act.

Agricultural education in the world.—III, North America, A. Brizi (*L'Enseignement agricole dans le monde. Vol. III, Amérique du nord, Roma: Inst. Internatl. Agr., 1938, vol. 3, pp. [XV]+277*).—This volume continues the series previously noted (E. S. R., 76, p. 417) and deals with Canada by provinces, the United States by States, Mexico, and Newfoundland.

A comparison of methods in vocational agriculture with varying instructional groups, S. Hitchcock and C. G. Howard (*Agr. Ed. [Des Moines], 10 (1938), No. 11, pp. 214, 215, 218*).—This study is based on forms filled in by the vocational agricultural teachers in Wyoming. A table shows the rated relative value of the basic teaching methods—telling, showing, doing, and checking or testing—with each subdivided into particular methods which are further subdivided into devices for adult farmers (evening classes), out-of-school farm youths (part-time classes), advanced and beginning farm boys in school, and town boys in school.

Farm projects and problems, K. C. Davis, rev. by S. Dickinson (*Chicago: J. B. Lippincott Co., [1937], rev., pp. [XI]+573, [pl. 1], figs. 231*).—This is a revised edition of the textbook previously noted (E. S. R., 57, p. 290).

A study of the types of problems investigated by graduate students in animal husbandry and the occupations in which the recipients of advanced degrees engage, R. W. PHILLIPS and F. N. ANDREWS. (Mass. Expt. Sta.). (*Amer. Soc. Anim. Prod. Proc., 30 (1937), pp. 182–188*).—Tables show the types of problems on which theses were submitted for 508 Master's and 58 Doctor's degrees in 31 land-grant colleges from 1920 to 1934 and the occupations of the recipients of the degrees.

Pig projects and profits, W. E. CARROLL and H. J. RUCKER (*Danville, Ill.: Interstate, 1937, pp. [191], figs. 22*).—Four projects—barrow, gilt, sow-and-litter, and herd—are outlined and discussed. Organizing and financing projects, principles of feeding, fitting, showing, and marketing projects of pigs, and scoring the projects are discussed, and a score card is included for each type of project.

FOODS—HUMAN NUTRITION

[**Nutrition studies by the Arizona Station**] (*Arizona Sta. Rpt. 1937, pp. 10, 11, 65–71*).—Included in this progress report (E. S. R., 78, p. 131) are studies on the vitamin A content of pumpkin and carrots; the utilization of vitamin A by dogs; the food consumption of 12 Mexican families; the extraction of fluorine from water by means of bone filters; and the effect upon rats of feeding aluminum with fluorine.

[**Foods and nutrition studies by the Florida Station**] (*Florida Sta. Rpt. 1937, pp. 68, 75–77*).—In this annual report summaries, some of which cover an extension of work noted previously (E. S. R., 77, p. 128), are given by R. B. French on the vitamin C content of Florida oranges and grapefruit; by C. F. Ahmann on pathologic changes in tissues and organs of animals on deficient rations; by Ahmann and O. D. Abbott on the relation of anemia in the children of Citrus, Jefferson, and Holmes Counties to the iron content of home-grown foods, and on the chemical composition and nutritive value of six different Florida honeys; and by Abbott on the jellying properties of 12 varieties of Florida grapes and the vitamin C content of fresh and canned tomatoes and tomato juice.

Foods and nutrition [**at the Hawaii Station**] (*Hawaii Sta. Rpt. 1937, pp. 60–64*).—This progress report (E. S. R., 76, p. 877) includes brief summaries of studies by C. D. Miller, M. Potgieter, and R. C. Robbins on the vitamin A, B (B_1), and G values of the cowpea, bitter squash (*Momordica charantia*), sweetpotato, pigeonpea, and horseradish tree (*Moringa oleifera*), all commonly used by the Filipinos; by Potgieter and Takase on the vitamin B and C contents of the taro; and by C. J. Hamre and L. Louis on the changes occurring in the blood and blood-forming organs of nutritionally anemic rats during the first 48 hr. of recovery.

[**Studies in foods and nutrition by the Iowa Station**] (*Iowa Sta. Rpt. 1937, pt. 1, pp. 88, 129, 160–167, fig. 1*).—The work covered by these progress reports (E. S. R., 77, p. 272) includes an extension of studies by V. E. and P. M. Nelson and B. Lowe on the effect of hydrogenated, stored, and heated lards on the destruction of vitamin A in foods (p. 129); by P. M. Nelson and P. P. Swanson on the conditions influencing the production of uniform experimental animals in the stock colony (p. 160); by P. M. Nelson, Lowe, and J. H. Buchanan on the relationships of the physical and chemical characteristics and constants of lard to its culinary value (pp. 160, 161); by Lowe on palatability studies with frozen poultry (pp. 161, 162); by Swanson and P. M. Nelson on the nature of the dietary deficiency causing progressive retardation of growth in successive generations of rats (pp. 162, 163), on the biological value of auto-

claved pork muscle (p. 163), of the dietary factors in the production and cure of toxemic pregnancies induced by the feeding of certain pork diets (pp. 163, 164), and of the lactogogue factor in liver and beef muscle (pp. 164, 165); by P. M. Nelson and M. A. Ohlson on the nutritional status of college women as related to their dietary habits: Anthropometric measurements, the formed elements of the blood, basal metabolism, and dietary balances (pp. 165–167); and by J. A. Schulz on the effects of the ingestion of fluorides on some of the constituents of the teeth, bones, blood, and tissues of albino rats (p. 88).

[Food and nutrition studies of the Massachusetts Station] (*Massachusetts Sta. Bul. 347 (1938), pp. 28, 29, 38, 39, 40, 41, 42, 47, 48, 73, 74–76, 97*).—Included in this progress report are summaries of studies, several of which represent a continuation of earlier work (E. S. R., 77, p. 879), by W. B. Esselen, Jr., J. E. Fuller, and G. S. Congdon on the influence of added iodine and kelp on intestinal flora of white rats (p. 28); by Congdon and Fuller on the influence of added iodine on the bacterial flora of milk (p. 28); by Esselen on the action of intestinal bacteria on ascorbic acid (vitamin C) (pp. 28, 29); by E. B. Holland, C. P. Jones, and W. S. Ritchie on the iron, copper, manganese, and iodine content of fruits and vegetables used as human foods (p. 38); by M. E. Freeman and Ritchie on the chemical changes in the cooking of vegetables (pp. 39, 40); by Ritchie on the changes in frozen meat during storage (p. 41); by W. Mueller and Ritchie on the nutritive value of chocolate milks (pp. 47, 48); by H. S. Mitchell and O. A. Merriam on a study of the nutrition of college women with respect to vitamin C requirements (p. 73); by Mitchell and M. Goldfaden on the relation of iodine or other minerals to the prevention of cholesterol-induced atherosclerosis in rabbits (p. 73); by C. R. Fellers, A. S. Levine, J. A. Clague, and Esselen on consumption of large quantities of apples; by Fellers, C. F. Dunker, and D. De Felice on the nutritive value of frozen foods (pp. 74, 75); by Fellers, Esselen, J. Bernotavicz, and A. D'Ercole on the nutritive value of industrial food byproducts (p. 75); by Esselen and Fellers on vitamin D investigations (p. 75); by Levine, W. A. Maclinn, and Fellers on home canning research (pp. 75, 76); by Maclinn, Levine, and Fellers on ascorbic acid in tomatoes and tomato juice as affected by maturity, variety, method of assay, and other factors (p. 76); by Esselen and Fellers on possible nutritional aspects of arthritis (p. 76); and by D. A. Bean, Clague, and Fellers on the composition and utilization of the Atlantic whiting, *Merluccius bilinearis* (p. 97).

Terminology of Government food grades, R. Russell. (U. S. D. A.). (*Jour. Home Econ., 30 (1938), No. 2, pp. 90–92*).—The grading system adopted by the Bureau of Agricultural Economics for nine foodstuffs is given. Canned vegetables are graded A, B, C, and Substandard; canned fruits A, B, C, D, E, and F; eggs AA—Special, A—Extra, B—Standard, and C—Trade; dressed poultry AA—Special, A—Prime, B—Choice, and C—Commercial; American cheese Extra Fancy, Fancy No. 1, 2, and 3, and Cull; white potatoes Fancy, Extra No. 1, No. 1, Commercial, and No. 2; apples Fancy, No. 1, Commercial, Utility, and Unclassified; lamb Prime, Choice, Good, Medium, Plain, and Cull; and beef Prime, Choice, Good, Medium, Common, Cutter, and Low Cutter. It is pointed out that these Government grades were set up for use as a basis for trading between farmers and middlemen and could not be expected to be adequate for consumers' retail buying.

Composition of certain beef cuts as affected by grade, location in cut, and method of cooking, M. Rogers, I. Gillum, B. L. Kunerth, and M. S. Pittman. (Kans. Expt. Sta.). *Jour. Amer. Dietet. Assoc., 13 (1937), No. 4, pp. 320–324*).—Nineteen samples of cooked and uncooked cuts of beef from the

top shoulder clod, rib, and top and bottom round of beef were analyzed for protein, fat, moisture, total ash, calcium, phosphorus, and iron.

In uncooked beef graded U. S. Good the mean fat content of the round was 11.4 percent, clod 19.6, and rib 25.5 percent; protein 22.6, 20.9, and 18.9; total solids 35.8, 42.8, and 47.2; moisture 64.2, 57.2, and 52.9; and total ash 1.133, 0.966, and 0.887 per cent, respectively. There was considerable variation in samples from different sections of the same cut. After oven roasting at 150° C. to an internal temperature of from 71° to 78°, roasting on a surface burner at a temperature of 76°, and braising in a steam-jacketed kettle to from 71° to 78°, all cuts increased in protein and fat and decreased in water content. In three paired cuts of beef the moisture and calcium contents decreased during roasting in the clod and rib cuts and the moisture and total ash content in the top round, while the fat, protein, total solids, total ash in the clod and ribs, calcium in the top round, phosphorus, and iron contents increased. The results would indicate that "the amount of protein in the rib cut, greatly increased due to fat and water losses in cooking, becomes comparable with that of the lean, cooked top round ordinarily regarded as a more abundant source of protein."

Selecting and using beef and veal, W. G. Kirk and A. L. Shealy (*Florida Sta. Bul. 321 (1938), pp. 34, figs. 30*).—This bulletin contains information on the factors which influence the grade of beef, the U. S. Department of Agriculture grading system, the various cuts of beef and veal and their uses, and the methods of preservation and preparation of meat for the table.

Cooked meats and poultry classified by chemical composition, C. Chatfield. (U. S. D. A.). (*Jour. Amer. Dietet. Assoc., 13 (1937), No. 4, pp. 312–319*).—From an analysis of data on the composition of 577 samples of cooked meats and poultry assembled by the Bureau of Home Economics, the following classification was formulated: Lean meat, dry, contains approximately 6 percent fat and 34 percent protein; lean meat, medium done, 6 and 30; lean meat, rare, 6 and 27; medium fat meat, dry, 18 and 30; medium fat meat, medium done, 18 and 27; medium fat meat, rare, 18 and 23; fat meat, medium done, 30 and 22; and very fat meat, medium done, 45 and 17 percent, respectively.

Hemoglobin regeneration value of egg yolk (*Kentucky Sta. Rpt. 1937, pt. 1, p. 43*).—This progress report summarizes a study of the hemoglobin regeneration value of egg yolk tested on eight anemic children.

The relation of fat to the utilization of lactose in milk, E. J. Schantz, C. A. Elvehjem, and E. B. Hart. (Wis. Expt. Sta.). (*Jour. Biol. Chem., 122 (1938), No. 2, pp. 381–390, fig. 1*).—A previous investigation (E. S. R., 70, p. 671) was continued, young rats being placed at weaning on a fresh whole milk diet supplemented with 1.5 mg of elemental iron in the form of ferric pyrophosphate, 0.15 mg of elemental copper as copper sulfate, and 0.15 mg of elemental manganese as manganese sulfate per 100 cc of milk. Daily urine, feces, and blood samples were tested for reducing sugars with Benedict's solution. Similar tests were made on rats receiving a mineralized skim milk diet supplemented by 5 μg of carotene daily. Another group of rats maintained on the whole milk diet until about 10 weeks old was placed on a restricted intake of the skim milk diet supplemented with different fat compounds. The rats were irradiated for 10 min. each day. Tests for urine sugar were made on a pig and a calf receiving the mineralized whole milk, skim milk, and skim milk with 4 percent corn oil diets.

No sugar was detected in the urine of the rats, pig, and calf when they were receiving the mineralized whole milk diet. Galactose was found when the mineralized skim milk diet was fed. Supplementation of the skim milk diet

with from 3 to 4 percent of butterfat, lard, corn oil, coconut oil, linseed oil, and palmitic and oleic acids resulted in complete utilization of the sugar. The lower triglycerides, such as glycerol, butyric, β-hydroxybutyric, caproic, and lactic acids, were ineffective. The blood sugar of the rats remained below 140 mg per 100 cc on the whole milk diet and rose to approximately 200 mg on the skim milk diet.

A study of soybean varieties with reference to their use as food, S. WOODRUFF and H. KLAAS (*Illinois Sta. Bul. 443 (1938), pp. 421–467, pl. 1, fig. 1*).—This bulletin contains information on the place of the soybean in the diet, the composition and general appearance, the methods of cooking soybeans in the green and mature states, the quality ratings of the cooked beans, the effect of different methods of preservation, and the preparation of soybean flour.

From a group of 466 vegetable and field types of the 1934, 1935, and 1936 crops, the authors selected by quality tests on the cooked beans 6 varieties which showed special merit and 11 which were rated good. Of the remainder 59 were rated good but less promising, 259 fair, and 131 poor. Shelling-time tests were included in the ratings on the green beans. Green beans from 12 of the superior varieties analyzed at the stage of maturity judged suitable for food use had an average moisture content of 69.9 percent, protein 12.25, fat 5.22, total carbohydrate 11.07 which includes 1.3 fiber and 4.18 sugars, and total ash 1.52 which includes 0.072 calcium and 0.0029 percent iron. The variation in distribution of the constituents was small among the different varieties in the green beans and, with the exception of fat, in the mature beans. The green beans preserved by freezing at −20° F. for part of the time and 0° for the remainder retained their good qualities, while the beans processed for 30–90 min. under 10-lb. pressure were unsatisfactory, as were those preserved by drying at room temperature and in the oven. Precooking the beans for 30 sec. before drying improved the quality slightly. The best flavored flours, according to tests on baking powder biscuits made from wheat flour in which 33 percent by weight was replaced by soybean flour, were obtained from the vegetable types of soybeans. The authors recommend the substitution of some of the vegetable types for the field types now used in the production of soybean flour.

The detailed ratings of the soybeans are contained in the appendix.

Home-made jellies, jams, and preserves, F. W. YEATMAN and M. C. STIEBELING (*U. S. Dept. Agr., Farmers' Bul. 1800 (1938), pp. II+18*).—In addition to recipes for jellies, preserves, marmalades, jams, conserves, and fruit butters, this contains information on the preservation of fruit products by sugar and score cards for use in judging the quality of the preserved products.

Basal metabolism in health and disease, E. F. DUBOIS (*Philadelphia: Lea & Febiger, [1936], 3. ed., rev., pp. 494, [pl. 1], figs. 98*).—In this revision of the volume previously noted (E. S. R., 57, p. 291), the most important change is the addition of a chapter dealing with the physical channels of heat loss.

Nutritional well-being and length of life as influenced by different enrichments of an already adequate diet, H. C. SHERMAN and H. L. CAMPBELL (*Jour. Nutr., 14 (1937), No. 6, pp. 609–620, fig. 1*).—The investigation of the relation between rapidity of growth and length of life (E. S. R., 75, p. 881) is continued in a study of the influence on approximately 175 male and female rats of increasing the content of milk proteins, calcium, vitamin A, and riboflavine in the authors' diet A to the amounts contained in diet B.

An increased intake of calcium alone and with butterfat (vitamin A) resulted in more rapid growth than when the vitamin A content alone was increased, longer life, extension of the period of adult vitality as measured by the length of time during which the female rats were able to have young, and

the production of larger young. Enrichment with vitamin A alone was followed by slower growth, larger adult size, and longer life, but did not appreciably affect the average age at which the female bore their first young or the size of the young. When the diet was modified by additional milk proteins, calcium, and riboflavine, by replacing one-fifth of the wheat with an equal weight of skim milk powder, rapid growth and development, extension of the life cycle, and the production of larger young rats resulted. The authors conclude that the increased amounts of calcium, vitamin A, and riboflavine "all contributed to the improvement in nutritional well-being and resultant health and longevity."

The relation of nutrition to the development of sound teeth, E. N. Todhunter (*Jour. Home Econ., 30 (1938), No. 2, pp. 93–98*).—In this review paper the environmental and metabolic theories of dental caries are discussed. From present evidence it is concluded that both metabolic and environmental factors are concerned in the prevention of tooth decay and that dental caries can be arrested by dietary means. Therefore, a diet high in minerals and vitamins, with an adequate balance of proteins, fats, and carbohydrates, is recommended. A list of 40 references to the literature is appended.

Calcium metabolism and teeth, I. Schour (*Jour. Amer. Med. Assoc., 110 (1938), No. 12, pp. 870–877, figs. 4*).—The author reviews the factors involved in calcification of the teeth, concluding that the adult tooth is not subject to modification in structure or calcification by changes in calcium metabolism and that no correlation exists between calcium metabolism and dental caries even during pregnancy. The growing tooth is sensitive to endocrine disturbances, to deficiencies of the vitamins A, D, and C, and to the ingestion of fluorides. More than 70 literature references are given.

Calcium deficiency and intestinal stasis, E. C. Robertson (*Jour. Nutr., 15 (1938), No. 1, pp. 67–71, figs. 4*).—In continuation of a previous investigation (E. S. R., 75, p. 422), groups of rats maintained on diets deficient in potassium and/or calcium, as described in a preliminary report (E. S. R., 79, p. 134), were given one dose of barium sulfate after from 5 to 7 weeks on the experimental ration. From X-ray and chemical analyses, it was demonstrated that the rats receiving any of the calcium-deficient diets excreted the barium slowly. The rats receiving the potassium-deficient diets excreted the barium normally, and those on the diets deficient in both calcium and potassium showed the same degree of intestinal stasis. It is concluded that feeding rats a low calcium diet, with and without an associated deficiency of potassium, will produce marked stasis and dilatation in the lower intestine.

The components of the vitamin B complex, E. M. Nelson (*Jour. Amer. Med. Assoc., 110 (1938), No. 9, pp. 645–649*).—In this article, which is the first in a series (several of which are noted below) on the vitamins prepared under the auspices of the Council on Pharmacy and Chemistry and the Council on Foods of the American Medical Association, the author designates and describes the various members of the vitamin B complex, namely, vitamins B_1, B_2, B_4, B_5, B_6, riboflavine, P-P factor, filtrate factor, and factor W. In the glossary are also listed factor Y, vitamin H, and factor I, which have properties common to but are not necessarily identical with vitamin B_6, and vitamin F, which is synonymous with vitamin B. The bibliography lists 78 references to the literature.

The chemistry of thiamin (vitamin B_1), R. R. Williams (*Jour. Amer. Med. Assoc., 110 (1938), No. 10, pp. 727–732, fig. 1*).—This paper is a review of the structure, synthesis, and biochemistry of thiamin (vitamin B_1), the incidence of biochemical lesions in thiamin deficiency, the methods of assay and distribu-

tion of thiamin in foods, and the diagnostic tests of a deficiency of the vitamin in humans. The bibliography lists 47 references.

The physiology of vitamin B_1, G. R. COWGILL (*Jour. Amer. Med. Assoc., 110 (1938), No. 11, pp. 805–812*).—The author surveys the present points of view concerning the distribution of vitamin B_1 in foodstuffs; the relation of vitamin B_1 to the functional activities of the alimentary tract, the heart, and the nervous system; and the role of vitamin B_1 in the metabolic processes of the body and its pharmacologic action. The bibliography contains 52 references.

The physiology and biochemistry of vitamin B_1, R. A. PETERS (*Roy. Soc. Trop. Med. and Hyg. Trans., 31 (1938), No. 5, pp. 483–492, figs. [3]*).—The author reviews the history of vitamin B_1 research and presents diagnostic representations of the relationship of vitamin B_1 to oxygen uptake and the scheme of tissue oxidation. The appendix contains the structural formula and chemical tests for the vitamin. The daily dose for man is given as approximately from 0.5 to 1 mg of the crystalline vitamin B_1. The bibliography lists 37 references.

Stabilizing effect of increased vitamin B (B_1) intake on growth and nutrition of infants: Basic study, M. W. POOLE, B. M. HAMIL, T. B. COOLEY, and I. G. MACY (*Amer. Jour. Diseases Children, 54 (1937), No. 4, pp. 726–749, figs. 8*).—The nutritive value of evaporated milk fortified with vitamin B_1 obtained from rice polishings was investigated in a 2-yr. study made on 193 normal, full term artificially and breast-fed infants who averaged approximately 5½ weeks of age at the beginning and 12 mo. of age at the end of the study. The infants were placed in alternate years in two groups, one receiving a formula containing evaporated milk with about 320 Sherman-Chase units of vitamin B_1 and the other serving as the control group on the ordinary formula which contained about 200 vitamin B_1 units. Cod-liver oil or irradiation of the evaporated milk supplied the vitamin D. Anthropometric measurements, body weight, blood examination, roentgenograms, and capillary resistance tests were made monthly.

The infants receiving the vitamin B_1 supplement showed a more regular and better stabilized growth and greater nutritional stability, particularly after about the fourth month of age, and a more efficient utilization of the milk. The infants were not entirely protected from rickets by the supply of vitamin D, since 9 showed moderate to severe rachitic lesions. The dehydrated lemon juice powder supplying 14 mg ascorbic acid daily protected against scurvy in all but 5 infants. The infants receiving vitamin B_1 supplement maintained a slightly higher hemoglobin level than did the control group.

Relation of increased vitamin B (B_1) intake to mental and physical growth of infants, M. G. COLBY, I. G. MACY, M. W. POOLE, B. M. HAMIL, and T. B. COOLEY (*Amer. Jour. Diseases Children, 54 (1937), No. 4, pp. 750–756*).—In continuation of the study noted above, the authors present a preliminary report on the results of a psychological investigation of the infant subjects. For a group of 25 infants on the vitamin B_1 augmented diet, 65 behavior items were observed at the age levels of 6, 9, and 12 mo., and the data obtained were compared with similar data for two normal control groups of the same age and number. At the 12-mo. age level 14 additional infants on the vitamin B_1 supplement were observed.

At the 6-mo. level the infants receiving additional vitamin B_1 showed definite acceleration in 59 and equality in 5 of the behavior items. This is interpreted to indicate a slightly accelerated maturation in basic behavior patterns other than the sympathetic, augmented alertness in attention, and perception phenomena and slightly accelerated adaptive learning behavior patterns At the 9-mo.

level the same general tendencies were observed, but the score of superior items dropped to 46, with more marked individual differences. At the 12-mo. level further leveling of the score occurred and several inconsistencies appeared, the locomotor responses being slightly retarded, although the prehensile reactions remained superior.

Biochemical changes, especially of pyruvic acid, in relation to some clinical features of beriberi, B. S. PLATT (*Roy. Soc. Trop. Med. and Hyg. Trans., 31 (1938), No. 5, pp. 493–500*).—Recent clinical studies on the therapeutic value of vitamin B_1 in beriberi are reviewed in this paper. The bibliography lists 15 references.

The pathology of beriberi, E. B. VEDDER (*Jour. Amer. Med. Assoc., 110 (1938), No. 12, pp. 893–896*).—This is a discussion of the pathology of human beriberi as shown by pathological changes in the heart, degeneration in the spinal cord and the peripheral nerves, and the occurrence of anasarca. The pathology of beriberi in birds and animals is distinguished from that of man. The bibliography contains 16 references.

The treatment of acute fulminating cardiac beriberi (Shöshin), R. BRUNEL HAWES (*Roy. Soc. Trop. Med. and Hyg. Trans., 31 (1938), No. 5, pp. 474–482*).—The response of 26 patients with acute fulminating beriberi to the administration of three preparations of crystalline vitamin B_1 is described. The amounts injected in 5 cases ranged from 1,600 to 3,200 pigeon units and from 1,500 to 3,500 international units given in from one to three doses. Of the 3 patients who failed to respond, failure in renal function is given as the cause of one death, multiple liver abscesses of one, and an insufficient dosage of vitamin B_1 in the other case. In the other patients the beneficial effect of the vitamin B_1 therapy was immediate and the response dramatic.

The therapeutic use of vitamin B_1 in polyneuritis and cardiovascular conditions, M. B. STRAUSS (*Jour. Amer. Med. Assoc., 110 (1938), No. 13, pp. 953–956*).—The author reviews the clinical indications of vitamin B_1 deficiency in man which involve mainly the nervous and circulatory systems, and the response to vitamin B_1 therapy. The bibliography contains 29 references.

Vitamin B_2 deficiencies as affected by dietary carbohydrate, A. F. MORGAN, B. B. COOK, and H. G. DAVISON. (Univ. Calif.). (*Jour. Nutr., 15 (1938), No. 1, pp. 27–43, figs. 5*).—Continuing a previous study (E. S. R., 75, p. 727), feeding experiments were carried out with 27 groups of rats receiving diets containing 65 percent sucrose, lactose, or cornstarch and deficient in all of the B_2 factors; in all but flavine, B_6, or the filtrate factor; and containing all three factors. The pure crystalline lactoflavine prepared by the method described by Lepkovsky et al. (E. S. R., 76, p. 839), was fed at the 20 μg level, the vitamin B_6 prepared by the method described by Birch et al. (E. S. R., 76, p. 423), at the 0.5-g level, and rice bran concentrate containing the filtrate factor and practically free from flavine but carrying a small amount of vitamin B_6 was fed at the 0.5-cc level per rat per day for periods varying from 12 to 36 weeks.

The rats receiving the lactose diet required the presence of the filtrate factor for normal growth and the prevention of cataract. The rats receiving the cornstarch diet required flavine and vitamin B_6, and those on the sucrose diet required vitamin B_6, flavine, and the filtrate factor for normal growth and the prevention of dermatitis. When one or more of the factors were supplied the diet containing sucrose gave the best growth response, and starch gave a better response than lactose. The blood sugar, urine sugar, and calcium values were markedly higher in the rats on the lactose diet, and when one or more of the vitamin B_2 factors was lacking the urine sugar increased in the rats on the

sucrose diet. It is concluded that lactose favors the production in the intestine of flavine and vitamin B_6, and that cornstarch either carries with it or favors the production of filtrate factor. Since sucrose neither carries nor produces in the intestine any of the vitamin B_2 factors, it is recommended as the best carbohydrate for use in vitamin B_2 assay diets. The authors note that the hair of the filtrate factor-deficient rats, particularly those on the sucrose diet, turned gray, but upon the addition of the filtrate factor the normal color returned rapidly. The administration of copper failed to prevent the graying of the hair.

Vitamin G and synthetic riboflavin, O. A. Bessey (*Jour. Nutr., 15 (1938), No. 1, pp. 11–15, fig. 1*).—Evdence is presented to show that the Sherman and Bourquin method (E. S. R., 66, p. 410) for determining vitamin G is a test for riboflavine. Rats placed at weaning on the Bourquin-Sherman diet and after 5 weeks given from 2.5γ to 5γ of pure riboflavine daily six times a week showed an average weight response nearly proportional to the level of riboflavine fed. One Sherman-Bourquin unit of vitamin G is calculated to be equivalent to from 2γ to 2.5γ riboflavine.

Chemical aspects of riboflavin, L. E. Booher (*Jour. Amer. Med. Assoc., 110 (1938), No. 14, pp. 1105–1111*).—This paper contains a review of the isolation of riboflavine from animal and plant products and its chemical structure, the synthesis of lumiflavine and riboflavine, the properties of riboflavine and related compounds, the vitamin activity as determined by rat assay, and the relation of riboflavine to the yellow oxidation enzyme which is present in the living cell and is concerned with cell respiration. The bibliography lists 55 references.

Riboflavin: Dietary sources and requirements, H. C. Sherman and C. S. Lanford (*Jour. Amer. Med. Assoc., 110 (1938), No. 16, pp. 1278–1280*).—The distribution of riboflavine (lactoflavine) in foodstuffs is discussed, and approximate values are given of the riboflavine content of 17 foods expressed in Sherman-Bourquin units of vitamin G as determined by the rat growth method. In the discussion of the dietary requirement for riboflavine two sets of estimates which are in fair agreement are presented. The bibliography contains 22 references.

Riboflavin and a further growth essential in the tissues.—Quantitative distribution and the influence of the food, E. V. Carlsson and H. C. Sherman (*Jour. Nutr., 15 (1938), No. 1, pp. 57–65, figs. 2*).—Following the technic used in a vitamin A investigation described previously (E. S. R., 54, p. 89) and using the Bourquin and Sherman method (E. S. R., 66, p. 410) for quantitatively measuring the relative amounts of riboflavine present, the authors determined the distribution of riboflavine in the tissues of rats and the influence upon the concentration of varying the level of intake of riboflavine. The basal diets, 429 and 555, consisted of casein 9 and 18 percent, Osborne and Mendel salt mixture 2 and 4, butterfat 9 and 8, cod-liver oil 1 and 2, and cornstarch 9 and 68 percent, respectively, with diet 429 containing in addition 30 percent skim milk powder and 40 percent whole wheat. In diet 555 the cornstarch contained an 80-percent alcoholic extract of 60 g ground whole wheat to every 100 g of the air-dry diet.

The tissues of rats reared on diet 429 when fed to the test animals supported growth consistently through the 8-week experimental period, but similar tissues from rats maintained on the riboflavine-deficient diet 555 resulted in less consistently sustained growth. The response on both diets was about the same for the first 20–25 days, after which the growth curve of the rats receiving diet 555 flattened out. The authors note that a similar flattening of the growth curve was reported for rats deficient in the Coward factor (E. S. R., 62, p. 589) and/or the Chick and Copping "Y factor" (E. S. R., 65, p. 592). It would appear that riboflavine is an essential constituent of the body tissues generally, and that the

level of intake exerts a definite influence upon the riboflavine deposited in the muscles, as well as in the liver where it is about 10–20 times more concentrated. There is a measure of similarity in the quantitative distribution between vitamin B_1 and riboflavine as contrasted with vitamin A.

The arrest of nutritional cataract by the use of riboflavin, P. L. Day, W. J. Darby, and K. W. Cosgrove (*Jour. Nutr., 15 (1938), No. 1, pp. 83–90, figs. 2*).—In continuation of previous studies (E. S. R., 78, p. 570) and following the same test procedure, the authors report a series of experiments made on groups of rats receiving the flavine-deficient diet 625 supplemented by 120 μg of riboflavine injected into the leg muscle tissue weekly as soon as cataractous eye changes appeared.

Of the 18 control rats receiving no supplement, 2 died early in the test period without developing cataract, and of the remaining 16 cataract was exhibited in 13, or 81 percent, and proceeded to maturity in 75 percent, the average time of appearance being 52 days, the time of maturity 67 days, and the survival time 74 days. Of the rats receiving riboflavine, 6, or 24 percent, did not have cataract and of the remaining 19 that showed lesion changes the cataract proceeded to maturity in both eyes of 2 rats. The cataract was arrested in one eye of 6 rats and in both eyes of 11, or in 89.5 percent of the 19 rats exhibiting the condition. A quick response in growth was demonstrated in the rats receiving riboflavine, new hair appeared in the animals with alopecia, and keratitis cleared up. It is concluded that riboflavine is a specific cataract-preventive substance for the rat.

The nutritional status of college women as related to their dietary habits with particular reference to vitamin C (*Rhode Island Sta. Rpt. [1937], p. 34*).—A progress report is given on the study of the urinary excretion of ascorbic acid and the capillary resistance of college women.

The vitamin C content of Connecticut home canned tomatoes, E. C. Rogers and D. B. Mathews (*Jour. Home Econ., 30 (1938), No. 2, pp. 114–116*).—Chemical assays by the Bessey and King modification (E. S. R., 71, p. 137) of the Tillmans titration method were made on miscellaneous lots of home- and commercially canned tomatoes, and bio-assays were made on some of the products, using the Sherman, La Mer, and Campbell method (E. S. R., 46, p. 865). The method of Tripp et al. (E. S. R., 78, p. 429) was used on two sample lots.

The average ascorbic acid content of the home-canned tomatoes varied from 0.111 mg in fruit canned in the pressure cooker to 0.167 mg per cubic centimeter of juice in tomatoes processed in the water bath, and of the commercially canned from 0.113 to 0.169 mg per cubic centimeter. As determined by the Tripp method one lot of home-canned tomatoes contained 0.143 mg and one of commercially canned 0.145 mg of ascorbic acid per cubic centimeter. The bio-assay values were in good agreement, about 4 cc of tomato juice being required to protect completely the guinea pigs from scurvy.

The vitamin C content of commercially canned tomato juice and other fruit juices as determined by chemical titration, F. C. Bing et al. (*Jour. Amer. Med. Assoc., 110 (1938), No. 9, pp. 650, 651*).—In this report by E. M. Bailey and H. J. Fisher of the Connecticut [New Haven] Experiment Station, presented by the Council on Foods of the American Medical Association, the results are given of determinations by the Bessey and King modification of the Tillmans method (E. S. R., 71, p. 137) of the cevitamic acid content of commercially canned fruit juices accepted by the Council prior to September 1, 1937.

The ash content of the 39 brands studied was found to be within the range of from 0.31 to 1.32 percent. In 8 brands of orange juice the cevitamic acid content varied from 0.31 to 0.56 mg and averaged 0.44 mg per cubic centimeter.

Corresponding cevitamic acid values for the other products were for 3 brands of lemon juice 0.41, 0.58, and 0.52; for 8 of grapefruit juice 0.29, 0.42, and 0.37; and for 3 of pineapple juice, 0.1, 0.18, and 0.14 mg per cubic centimeter, and for 17 of tomato juice 0.13, 0.29, and 0.2 mg per gram, respectively. Expressed as the average approximate number of international units of vitamin C per 100 cc of juice, the lemon juice contained 1,000 units, orange juice 900, grapefruit juice 750, tomato juice 400, and pineapple juice 300 units.

It is noted that if 50 mg cevitamic acid (1,000 units of vitamin C) is taken as a suitable allowance for the normal adult, the daily requirement can be met by the consumption of about one-half cup canned lemon or orange juice, one-half to two-thirds cup grapefruit juice, one to one and one-eighth cups tomato juice, or one and one-half cups canned pineapple juice. It would appear that canned orange juice is only slightly lower in vitamin C than the fresh juice.

Losses of vitamin C during cooking of Northern Spy apples, K. M. Curran, D. K. Tressler, and C. G. King. (N. Y. State Expt. Sta. et al.). (*Food Res., 2 (1937), No. 6, pp. 549–557, figs. 2*).—The effect upon the vitamin C content of the Northern Spy variety of apple during various cooking processes was investigated, using the Mack and Tressler modification (E. S. R., 78, p. 154) of the Tillmans titration method. The results of bio-assays made by the method previously described by Tressler et al. (E. S. R., 76, p. 726) on frozen samples of raw, quartered apples and strained applesauce were in good agreement with the titration values obtained.

The vitamin C content of the raw apples was about 0.11 mg per gram for the unpeeled and 0.1 mg for the peeled samples and 0.07 mg for applesauce made from both peeled and unpeeled apples cooked for 18 min. After 3 hr. at room temperature the unpeeled apple lost 36 percent and the peeled 30 percent of the vitamin C content. The greatest loss occurred during the first 4 min. of cooking in the sauce made from peeled apples, and at the done stage approximately 23 percent of the vitamin C had been lost from the unstrained sauce and 32 percent from the strained sauce made from unpeeled fruit. The baking process removed about 80 percent of the vitamin C content of the apples baked in casseroles and of those made into pies. After 48 hr. at room temperature the vitamin C content of the pie filling had been reduced to 12 percent. It would appear that the factors influencing the loss of ascorbic acid were the length of the cooking period, the relatively slow rate of heat penetration with corresponding delayed effect on the oxidase, and the presence of atmospheric oxygen.

Vitamin C saturation—kidney retention after an intravenous test dose of ascorbic acid, I. S. Wright and E. MacLenathen (*Soc. Expt. Biol. and Med. Proc., 38 (1938), No. 1, pp. 55–59*).—To determine the possibility of error through faulty elimination by the kidneys in the saturation test for vitamin C by intravenous injection of a 1,000-mg dose, as described previously (E. S. R., 77, p. 281), parallel blood and urine determinations at intervals of 15 min., 1½ hr., 3 hr., and 5 hr. after the injections were made on five adult subjects with and without renal disease.

In two healthy subjects, and one with glomerulonephritis with no nitrogen retention, typical curves for blood and urine concentration were observed, the peak in the blood curve coming at 15 min. and in the urine at 1½ hr. In one patient with malignant hypertension accompanied by kidney damage and nitrogen retention, the total excretion of ascorbic acid at the end of 5 hr. amounted to only 78 g, and the blood values remained high until the 5-hr. test, indicating ascorbic acid retentions in the blood. In another patient suffering from glomerulonephritis with nitrogen retention, the blood curve was normal in form but the urine values were low, amounting to only 42.3 mg at the end of the test.

Although the number of subjects is too small for definite conclusions, the data show retention of vitamin C only in patients with marked nitrogen retention.

Intradermal test for vitamin C deficiency, B. PORTNOY and J. F. WILKINSON (*Brit. Med. Jour., No. 4023 (1938), pp. 328, 329, fig. 1*).—This report gives further details of the Rotter (E. S. R., 78, p. 571) method of detecting vitamin C deficiencies by noting the time required to decolorize a sterile solution of 2,6-dichlorophenolindophenol injected intradermally in the forearm. The solution is prepared by dissolving 4 mg of the dye in 4.9 cc of distilled water and passing the solution through a Seitz filter. After an aliquot has been titrated against a standardized solution of ascorbic acid, the dye filtrate is diluted to a strength of 2 mg in 4.9 cc. The site chosen for injection is the skin of the forearm in an area free from hair and small superficial veins. The skin is cleaned and stretched, the needle is inserted intradermally, and 0.01 cc of the solution injected immediately under the epithelium. This produces a wheal 2 mm in diameter. The time for complete decolorization of the dye color is noted for four such wheals and the average taken as the decolorization time.

Tests have been made on a series of 103 patients under observation for other purposes. In a group of 35 on whom blood values were determined before and after saturation, 21 with blood values of from 0.27 to 0.52 mg per 100 cc required from 3 (one case) to 29, with an average of 16.9 min. for decolorization, only 5 having values less than 10. After 17 of this group had been saturated with ascorbic acid, with blood values of from 1.32 to 2 mg per 100 cc, the time required for decolorization ranged from 0.5 to 6, with an average of 2.3 min. In 14 subjects tested first in a state of partial saturation, with blood values of from 0.72 to 1.3 mg per 100 cc, the time required for decolorization varied from 3 to 13, with an average of 7.5 min. In a second group consisting of 68 patients whose dietary histories were known, but who had received no tests for ascorbic acid, 18 on full mixed diets, including large amounts of fresh fruits daily, gave decolorization times of from 2 to 7, with an average of 3.4 min., 37 on fair diets without extra fruit from 3 to 16, with an average of 8.8, and 13 on very deficient diets with no fresh fruits or vegetables or vitamin C concentrates gave, in all but one instance, values varying from 10 to 33 min.

The authors conclude that although other reducing substances in the skin may be concerned in the decolorization phenomenon, the method is of some value as a rapid clinical test for vitamin C deficiency. A decolorization time of less than 5 min. is considered to indicate tissue saturation with vitamin C and of 10 min. or longer a deficiency.

Etiology of sebaceous gland atrophy in the rat in avitaminosis, S. G. SMITH (*Jour. Nutr., 15 (1938), No. 1, pp. 45–56, figs. 8*).—In continuation of previous studies (E. S. R., 75, p. 888), the author studied the effects of deficiencies of vitamins A and G, together with B, on the production of skin changes in rats involving a thinning of the epithelium and atrophy of the sebaceous glands. The A-deficient diet contained casein 18 percent, Osborne and Mendel salt mixture 4, dry brewers' yeast 10, cornstarch 67, and sodium chloride 1 percent and 6 drops of 250-D viosterol per kilogram of diet. For one group the brewers' yeast was replaced by 20γ crystalline vitamin B_1 and 0.5 g autoclaved yeast. The G-deficient diet contained casein 18 percent, salt mixture 4, butterfat 8, cod-liver oil 2, and sucrose 68 percent, supplemented by 20γ vitamin B_1 and 20γ lactoflavine and in one group by 0.5 g autoclaved yeast. The A and G supplements were fed separately or mixed into the diet. Microphotographs were made of tissue samples obtained from cross sections of the tail at the base, midportion, and tip.

In the G-deficient rats, with and without adequate vitamin A, the skin changes occurred regularly. When the G supplement was mixed into the vitamin A- and B-deficient diets, similar skin changes, but to a much less marked degree, occurred. When the vitamin A and B supplements were fed separately to the G-deficient diets, the animals were not protected against the development of epithelial and sebaceous gland changes. The A-deficient rats showed only a slight change in the sebaceous glands when the vitamin G supplement was fed separately. It is concluded that a deficiency of some factor of the vitamin G complex is responsible for the atrophy of the sebaceous glands in the rat's tail.

Relation of nicotinic acid to growth and dermatitis factors in rice polishings, C. A. Cook, M. F. Clarke, and A. E. Light (*Soc. Expt. Biol. and Med. Proc., 37 (1937), No. 3, pp. 514–518*).—In continuation of a previous study (E. S. R., 78, p. 426), the authors tested on rats maintained on a purified sucrose diet supplemented by 20γ thiamin chloride and 15γ riboflavine the growth-promoting and curative properties of the extracts and eluates derived from rice polishings and of nicotinic acid and amide.

The extracts and eluates from the rice polishings represented concentrated sources of the rat dermatitis factor. A dose of 75 mg of the concentrate to depleted rats resulted in adequate growth and cure of the dermatitis condition. It would appear that the active component of the rice polishings is not identical with nicotinic acid or amide, since the administration of 25 mg gave a low growth rate, which did not improve upon the addition of the nicotinic acid or amide. Over a 14-day period 1 mg of nicotinic acid amide with 5 mg of yeast adenylic or nucleic acid had no supplementary effect in rats receiving 20γ thiamin, 15γ riboflavine, and 20 mg of the pyridine eluate (dermatitis factor). The injection of the growth hormone of anterior pituitary extract failed to induce growth in the rats depleted of thiamin, riboflavine, and the dermatitis factor.

The cure of canine blacktongue with nicotinic acid, H. R. Street and G. R. Cowgill (*Soc. Expt. Biol. and Med. Proc., 37 (1937), No. 3, pp. 547, 548, fig. 1*).—The administration of nicotinic acid hydrochloride by mouth in a dosage of approximately 5 mg per kilogram of body weight per day produced prompt resumption of normal appetite, stimulated growth, and cured mucous membrane lesions of the mouth in two dogs maintained on the Goldberger diet No. 123 in which the cowpeas had been omitted and the casein content increased slightly.

The absence of nicotinic acid in the urine of pellagrins and a method for its quantitative estimation, S. P. Vilter, T. D. Spies, and A. P. Mathews (*Jour. Amer. Chem. Soc., 60 (1938), No. 3, pp. 731, 732*).—In continuation of the investigation previously noted (E. S. R., 79, p. 280), the authors demonstrated the presence of nicotinic acid or a substance with a similar color reaction to 2,4-dinitrochlorobenzene in the urine of normal persons eating a well-balanced diet and its absence from the urine of normal persons on a diet free from nicotinic acid and of patients with subclinical pellagra or pellagra in relapse who were not receiving nicotinic acid therapy. The test is based on the reaction of 2,4-dinitrochlorobenzene with the tertiary nitrogen of the pyridine ring and the decomposition of the addition product with sodium hydroxide. The colored substance produced is purple in the presence of the pyridine derivative, purple-red with nicotinic acid, and Burgundy-red with nicotinic amide. Pyridine reacts immediately, but with nicotinic acid and amide the solution must be evaporated to dryness with the reagent before the color reaction will

take place. No other substance which produces color by this reaction was found in the pellagrin urine examined.

Effect of yeast and nicotinic acid on porphyrinuria, T. D. Spies, E. S. Gross, and Y. Sasaki (*Soc. Expt. Biol. and Med. Proc., 38 (1938), No. 1, pp. 178–181*).—The administration of 500-mg doses of nicotinic acid to two pellagra patients and four with other diseases resulted in the disappearance of porphyrinuria within 24 hr. in five cases and after a period of several days in the one patient with severe pellagra. Similar results were obtained in one case of barbital intoxication and one with cardiac decompensation when 50-g doses of yeast were given. Negative tests for porphyrinuria were obtained in six normal persons eating large amounts of a well-balanced diet.

TEXTILES AND CLOTHING

[Studies in textiles and clothing by the Iowa Station] (*Iowa Sta. Rpt. 1937, pt. 1, pp. 172, 173*).—This progress report (E. S. R., 77, p. 284) contains summaries of a continuation by R. Edgar of studies on the degradation of wild silk, silk, and weighted silks by acid oxidation and of the protection from degradation which certain finishes provide wool.

The influence of various kinds of wool on some of the physical properties of flannel, E. Pierson (*South Dakota Sta. Rpt. 1937, pp. 25, 26*).—Further progress is reported on this investigation (E. S. R., 77, p. 140).

HOME MANAGEMENT AND EQUIPMENT

[Home management studies by the Rhode Island Station] (*Rhode Island Sta. Rpt. [1937], pp. 32, 33*).—Progress reports are given (E. S. R., 77, p. 892) on studies of the allocation of household tasks in the homes of employed married women, and of the kinds and maintenance of floor furnishings best suited for household use.

[Studies in household equipment by the Iowa Station] (*Iowa Sta. Rpt. 1937, pt. 1, pp. 168–172, figs. 6*).—This progress report (E. S. R., 77, p. 286) contains summaries of a continuation by L. J. Peet on the performance of certain types of ice refrigerators used in the home (pp. 168–170); and by Peet and F. M. Madden on the effect of size of pan upon the efficiency of the surface units of electric, kerosene, coal, and gasoline ranges (pp. 170–172).

The accuracy of pressure gauges used on household steam pressure cookers, A. E. Baragar (*Nebraska Sta. Res. Bul. 99 (1938), pp. 18, figs. 3*).—In addition to a study of the accuracy of 52 new and used pressure gages, other phases investigated were the proper functioning of the safety valve, the methods of sealing the lid to the cooker, the evacuation of air from the cooker, and the use of a thermometer as a temperature indicator.

For testing the gages a 12-qt. cooker was fitted with a U-tube mercury thermometer, a copper-constantan thermocouple for measuring the temperature inside the cooker, a ball-and-socket type of safety valve, an automatic air-release valve, a petcock, an opening for the gage being tested, and a copper tubing connected with a mercury manometer which was used as the standard for comparisons and was termed the "master gage." A Bourdon gage was used as a "test gage" in the preliminary tests, but it was found that when the gage was hot the indicated pressure was higher than the actual pressure in the cooker. The gages were grouped into class A, in which the Bourdon tube is coupled to the dial pointer by a lever and a gear operating a small pinion with a hair spring, and class B in which the coupling is made simply by a lever. The dial scale is calibrated in divisions of 1 lb. in class A and of 5 lb. per square inch in class B gages. The test procedure consisted in heating the cooker so that

to cause a difference of 5 lb. pressure required about 4 min. for the class A and 2-3 min. for the class B gages. Temperature and pressure readings were taken for each pound on class A and for each 5 lb. on class B gages from 0 to 20 lb. The gage readings were compared with the pressures determined from the manometer and with those calculated from the thermometer temperatures. The release and closing pressures of the safety valves were checked with a calibrated Bourdon-type gage. Pressure cookers with the gage substituted by an assembled checked gage and tire valve were sealed, immersed in water, and by means of a tire pump a pressure inside the cooker of 20 lb. per square inch was attained. The presence of leaks was demonstrated by the time rate of decrease in pressure and the production of bubbles.

The master gage proved to be about 8 times as sensitive as the thermocouple and 10 times as sensitive as the thermometer in determining the actual pressures. A study of 12 new class A gages demonstrated the possibility of constructing gages accurate within ±0.5 lb. per square inch. Using that figure as the limit of correct calibration, only 11 of 40 other gages tested were accurate at 5 lb. pressure, 5 at 10 lb., 7 at 15 lb., and 8 at 20 lb. pressure per square inch. The safety valves in 6 of 11 cookers tested blew off satisfactorily at pressures of from 18.5 to 24.1 lb., while the other 5 began to leak at pressures below the release pressures. The closing pressures ranged from 7 to 21.5 lb. Of 10 new cookers 8 leaked at the safety valve at pressures of 18 and 20 lb., 7 leaked slightly and 2 badly around the rim, and 2 had slow leaks from the petcock. The type of cooker which has the cover clamped on by a band with one bolt was the easiest to seal. The automatic air release valve which was installed in the cooker proved satisfactory to insure complete exhaustion of the air.

Your pressure cooker: How to choose it and how to use it for canning, A. E. Baragar (*Nebraska Sta. Circ. 57 (1938), pp. 14, figs. 15*).—This circular contains information based upon the results of the study noted above. In choosing a pressure cooker the most important points are considered to be the size and shape, the material from which it is made, the method of sealing and clamping, the type of pressure gage, safety valve, and petcock, and the possible use of a thermometer. In using the pressure cooker for canning the nonacid foods, the gage pressure should be increased ½ lb. per square inch for each additional 1,000 ft. at altitudes above 1,000 ft., the pressure gage should be checked at the beginning of each canning season, and the temperatures indicated on the pressure gage should not be used as indicators of the processing temperatures, since these temperatures are correct only for processing at sea level with an accurate gage. While the thermometer cannot replace the pressure gage, the cooker may be equipped with a thermometer as well as a gage if it is desired to process in terms of temperature readings.

A brief outline of the general procedure for processing foods in the pressure cooker is included.

Canning with pressure equipment (*Nebraska Sta. Rpt. [1937], p. 34*).—Brief summaries are given of the results obtained by Nebraska homemakers.

MISCELLANEOUS

Arizona's changing agriculture: Forty-eighth Annual Report [of Arizona Station], 1937, R. S. Hawkins (*Arizona Sta. Rpt. 1937, pp. 101, figs. 16*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue. Meteorological data are included.

Annual Report [of Florida Station], 1937, W. Newell et al. (*Florida Sta. Rpt. 1937, pp. 184+XI, figs. 21*).—The experimental work not previously referred to is for the most part abstracted elsewhere in this issue. Meteorological observations (pp. 115-121), including data from the Everglades (pp. 136,

137–139) and the North Florida Substation at Quincy (pp. 159, 160), are also included.

Report of the Hawaii Agricultural Experiment Station, 1937, [O. C. MAGISTAD ET AL.] (*Hawaii Sta. Rpt. 1937, pp. 117, pl. 1, figs. 16*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Report on agricultural research [of Iowa Station] for the year ending June 30, 1937, I, II, R. E. BUCHANAN ET AL. (*Iowa Sta. Rpt. 1937, pts. 1, pp. 264, figs. 50; 2, pp. 84, figs. 9*).—Part 1 of this report includes reports on all active projects except those relating to corn; part 2, a report on all work coordinated under the Iowa Corn Research Institute. The experimental work not previously noted is for the most part referred to elsewhere in this issue.

Fiftieth Annual Report of [Kentucky Station], 1937, I, II, T. P. COOPER ET AL. (*Kentucky Sta. Rpt. 1937, pts. 1, pp. 67; 2, pp. [3]+306+31, figs. 49*).—Part 1 includes the report of the director, the experimental work referred to and not previously noted being for the most part abstracted elsewhere in this issue. Part 2 contains reprints of Bulletins 368–377 and Circulars 46–48, previously noted.

Annual report of the Massachusetts Agricultural Experiment Station, 1937, F. J. SIEVERS ET AL. (*Massachusetts Sta. Bul. 347 (1938), pp. 99, fig. 1*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Fiftieth Annual Report of the [Michigan Station], 1937, V. R. GARDNER (*Michigan Sta. Rpt. 1937, pp. 81–93*).—This consists mainly of lists of publications and projects.

Fifty-first Annual Report of [Nebraska Station, 1937], W. W. BURR (*Nebraska Sta. Rpt. [1937], pp. 67*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Fiftieth Annual Report of [Nevada Station], 1937, S. B. DOTEN ET AL. (*Nevada Sta. Rpt. 1937, pp. 45, figs. 4*).—In addition to the usual report on the work of the year, abstracted for the most part elsewhere in this issue, a discussion is given of some aspects of the national program for the development of a permanent American agriculture and the relationships of this program to the agricultural colleges and experiment stations.

Agricultural research in New Hampshire: Annual report of the director of New Hampshire Agricultural Experiment Station for the year 1937, J. C. KENDALL (*New Hampshire Sta. Bul. 304 (1938), pp. 40*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Fiftieth Annual Report [of Rhode Island Station, 1937], B. E. GILBERT (*Rhode Island Sta. Rpt. (1937), pp. 44*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue. Meteorological data (pp. 42, 43) are also included.

Annual Report of the South Dakota Agricultural Experiment Station, [1937], J. W. WILSON ET AL. (*South Dakota Sta. Rpt. 1937, pp. 41*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue. Results of studies of farm organization and soil management practices in Brown, Lincoln, and Potter Counties, by G. Lundy (pp. 4, 5), are also included.

Catalog of the official publications of the Florida Agricultural Experiment Station and Florida Agricultural Extension Service, 1888–1937, compiled by I. K. CRESAP (*Florida Sta., 1938, pp. 97*).—These publications are listed, together with a subject-matter index of the station bulletins and an author list of articles by station workers in other publications.

NOTES

Arkansas University and Station.—A group of Crittenden County farmers have given to the College of Agriculture 100 acres of rich delta land near Clarkedale. The tract will be operated as a substation of the Cotton Branch Station in Lee County, and will be devoted to the breeding of cotton and corn and experimental work with insect control, legumes, and small grains on the delta soil.

Projects recently undertaken include further experiments with rice, a survey of hardwood milling, handling, and seasoning practices in the State with a view to extending the economical utilization of hardwoods, an analysis of clothing inventories of rural families, and a study of the relative value of various home canning methods in preserving vitamin C in tomato juice.

Delaware University and Station.—Dr. F. S. Lagassé has resigned as research horticulturist, effective September 15, to accept a position with the U. S. D. A. Bureau of Plant Industry, and will be stationed at Gainesville, Fla. He has been succeeded by Dr. Elmer W. Greve as assistant horticulturist and instructor in horticulture, and he in turn by William H. Phillips, Jr. S. M. Hopperstead has been appointed assistant plant pathologist.

Illinois University and Station.—Dr. Charles F. Hottes, associated with the institution since 1895, retired in June. He had been head of the department of botany since 1928 and since 1922 consulting plant physiologist in the station.

The appointments in the College of Agriculture of 17 assistants are announced as follows: Agricultural economics, G. T. Hudson (rural sociology), R. J. Mutti, and W. S. Read; agronomy, E. E. Cockrum (crop production), J. B. Fehrenbacher and J. S. McVickar (soil survey), W. H. Freeman (plant genetics), L. T. Kurz (soil survey analysis), and T. J. Pearse, Jr. (soil physics and soil survey); dairy husbandry, R. E. Heyl (dairy manufactures); home economics, Gertrude Esteros (clothing), Beulah Alt (clothing and textiles), Margaret Goodyear and Mary Frances Reed (home management); Ida A. Fisher (foods), and Herta Breiter; and horticulture, W. N. Brown.

Iowa College and Station.—The retirement on September 15 is announced of Dr. Martin Mortensen, head of the dairy industry department since 1909. His position has been filled by the promotion of C. A. Iverson, a member of the staff since 1915.

Florence A. Fallgatter, chief of the home economics education service of the Office of Education, U. S. Department of the Interior, has been appointed head of the department of home economics education, vice Cora B. Miller, who will continue as a member of the department.

Kentucky University and Station.—Z. L. Galloway, instructor and assistant in farm management, has resigned. Recent appointments include E. Bradley Offutt as assistant chemist, Drs. Alfred F. Nolan and Leonard J. Goss as assistant pathologists, and W. D. Armstrong as horticulturist.

Maryland University.—Recent appointments include Fred H. Leinbach as professor of animal husbandry vice K. A. Clark, resigned to engage in commercial work; Dr. Herbert R. Bird as associate professor of poultry husbandry; Dr. Kenneth L. Turk, assistant extension professor of animal husbandry in Cornell University as professor of dairy husbandry vice L. W. Ingham, who has accepted a position in the National Farm School in Doylestown, Pa.; and James B. Outhouse as instructor in animal husbandry.

Massachusetts College and Station.—George Graves has resigned as assistant research professor in nursery culture, effective September 15, to join a commercial nursery and has been succeeded by Harold S. Tiffany, research assistant in nursery culture. Dr. Raymond T. Parkhurst has been appointed head of the poultry department effective September 1.

Missouri Station.—A new dairy unit is under construction. It will be a two-story structure attached to the present building and will cost $117,000.

Montana College and Station.—A department of dairy industry has been established in the station, with Dr. J. A. Nelson, previously in charge of college and extension work in this field, as head. Armin J. Hill has been appointed assistant in rural electrification, with his time divided equally between the station and the extension service. The following resignations are noted: Jesse R. Green, assistant chemist, to engage in commercial work; M. H. Saunderson, range economist, to become associated with the U. S. D. A. Forest Service at Ogden, Utah; Phil S. Eckert, instructor in economics and sociology and assistant in agricultural economics, and Stanley B. Speck, assistant in chemistry, both to engage in graduate work, and succeeded, respectively, by Oswand A. Parsons and Donald R. McCormick; and Ruth Spick Haggerty, assistant in home economics.

Nebraska University.—Chancellor E. A. Burnett has retired, becoming chancellor emeritus September 1. He has been succeeded by Dr. C. S. Boucher, president of West Virginia University.

New York State Station.—About 2,500 visitors were in attendance at the first annual station field day. The program included tours, demonstrations, radio broadcasting on the National Farm and Home Hour, and an address by Dr. H. E. Barnard, research director of the National Farm Chemurgic Council, on The Use of American Farm Products Through Applied Science.

North Dakota College and Station.—Dr. F. M. Bolin, associate veterinarian in the Oregon Station, has been appointed head of the department of animal pathology and hygiene in the station and associate professor in the college.

Washington College and Station.—Herman Fallscheer has resigned as assistant State chemist to become assistant chemist in the newly established Tree Fruit Branch Station at Wenatchee and has been succeeded by Melvin C. Midgley. W. A. Harvey has been appointed assistant in farm crops to undertake investigations in weed eradication and control.

West Virginia University and Station.—Dr. J. L. Cartledge, assistant professor of genetics, has also been appointed assistant geneticist in the station. Dr. E. A. Marten, assistant professor of bacteriology, has also been appointed assistant bacteriologist. Ruth D. Noer, dean of women, has been designated head of the division of home economics, succeeding Rachel H. Colwell, who continues on a part-time basis.

Wisconsin University.—Dr. Walter W. Wisnicky, director of livestock sanitation in the Wisconsin State Department of Agriculture and Markets, has been appointed professor of veterinary science, effective August 15.

EXPERIMENT STATION RECORD

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RECENT INTERNATIONAL GATHERINGS OF INTEREST TO AGRICULTURAL AND HOME ECONOMICS

International organizations devoting attention to the economic problems of the farm and home have been in existence for at least a generation, but for the most part their meetings and immediate impacts have been confined to the continent of Europe. For this reason the holding of two such gatherings in North America during the past few weeks has been of special interest. These gatherings have afforded an unusual opportunity for American workers along these lines to familiarize themselves with some of the broader aspects of their respective fields and for the general public to visualize these important subjects in their world relations.

Chronologically speaking, the first of the two groups was the Fifth International Conference of Agricultural Economists, which met at Macdonald College in Quebec from August 21 to 28, 1938. The other was the Seventh International Management Congress, which held its sessions from September 19 to 23 in Washington, D. C. Both of the groups dealt with matters of interest to agricultural economics, and the Management Congress, through its section on home management, also attracted many workers in home economics.

The conference of agricultural economists had its beginnings in England in a more or less informal meeting in 1929 at Dartington Hall, the home of its sponsor and president, Mr. L. K. Elmhirst. Prominent among the early participants from the United States were Drs. C. E. Ladd and George F. Warren of Cornell University. The latter became a vice president in 1930 and served in that capacity until his death last spring. Both took a leading part in the arrangement of the second conference, which was held at Cornell in 1930 as noted in these columns (E. S. R., 63, p. 601). The third Congress took place in Germany in 1934, and the fourth at St. Andrew's University, Scotland, in 1936.

The 1938 conference brought together well over 350 members, representing about 20 countries. The Canadian delegation numbered about 60, and over 200 men and women were in attendance from the United States. Among the latter group were the Secretary and

Under Secretary of Agriculture, Dr. B. Youngblood as the representative of the Office of Experiment Stations, and numerous members of the Bureau of Agricultural Economics and other Department agencies, the Farm Credit Administration, and at least 26 of the land-grant colleges and universities and their experiment stations.

Four major topics were under discussion by the conference as a whole. These were the social implications of economic progress in present-day agriculture, land tenure and the social control of the use of land, farm labor and social standards, and international trade in relation to agricultural development. There were also numerous miscellaneous papers and a series of group conferences, two of which dealt with research in farm management and research in marketing.

A goodly proportion of the papers making up this program were contributed by members of the Department and station staffs. Among them may be mentioned the address of Secretary Henry A. Wallace on the subject of international trade. In this address he discussed the difficult situation now confronting the United States, stating that "American agriculture is meeting the strain by two coordinated lines of attack. On the one hand, we are reducing the pressure for imports by making such judicious reductions in our tariff as are possible without damaging any domestic industry. In exchange for these reductions we are obtaining concessions from foreign countries in their barriers to trade in our export products. On the other hand, we are organizing agriculture in such a way as to adjust supplies to reasonable market potentialities." In conclusion he expressed the belief that "it might be an interesting thing, indeed, sometime in the future when the world is a little more civilized, if the various agricultural ministries of the world could meet together to draw up a set of principles on which all nations could agree. Somehow I have a feeling that all nations can agree on the desirability of systems of agriculture which will maintain soil fertility and which will tend to give the farm section of the population a fair share of the national income. Perhaps there could be agreement on the desirability of giving to agriculture the moral, legal, and economic equivalent of what the corporate form of organization gives to industry while at the same time the family-sized farm is maintained."

Another thought-stimulating discussion was that of Under Secretary M. L. Wilson on the topic Economic Agriculture and the Rural and General Social Welfare. In this "discussion of social well-being in the light of economic realities," Dr. Wilson maintained that "the condition of the world today, brought about essentially by the impact of science and technology, is one of institutional and psychological confusion." This condition he regarded as involving an unavoidable implication of social planning, but he pointed out

that "in a democracy we still have much to learn in the way of devising new institutions and new mechanisms for making planning a product of the democratic process." "There must be," he argued, "an extended and broadened educational system that will improve the ability of the citizenry to take part in process of policy-making. This constitutes a challenge to all educators to teach less dogma and to cultivate greater tolerance of new ideas. It is also a specific challenge to agricultural educators to devote proportionately less attention to technical studies and to give proportionately more attention to the social sciences and the humanities in order that the new generations of farmers may have a broader understanding of man and of society."

Most of the papers of the delegates from abroad dealt with conditions in their respective countries, but a number were of general applicability. Among the latter class was the discussion of Dr. Wilson's paper by Prof. A. W. Ashby of University College of Wales, in which he said in part: "My own clear and firmly held view has always been that the effective direction or manipulation of agricultural and rural institutions will at times require the service of all the reliable social sciencies and in particular of the studies which we call, for convenience, economic and social history, economics, political philosophy or political science, social psychology, and sociology. . . . It will be those economists who wish the greatest freedom for technological progress who will set the highest standards of social welfare; these will ask for technological progress and efficiency because they see the need of greater material resources for social welfare uses."

Aside from the presentation of a section program directly related to agricultural economics, the Management Congress in Washington seemingly had little in common with the Canadian meeting. As its name indicated, it was not primarily agricultural but covered the entire field of management. Its general sessions were built around the major accomplishments of management both as to its relation to the American business system and the public welfare, and four of its six sections dealt with public administration, production, distribution, and personnel. Likewise, most of the 25 national organizations sponsoring the Congress were those of business interests or of such broad scope as the American Engineering Council, but among them were the National Farm Chemurgic Council, the American Dietetic Association, and the American Home Economics Association. These groups were especially interested in the sections on agriculture and home management, and under their auspices a program was arranged in which the land-grant institutions and the Department of Agriculture were generously represented.

Under the plan adopted about 200 papers were submitted to the Congress, but in lieu of their delivery they were printed and distributed to the members in advance and briefly summarized at the sessions by a "rapporteur," following whose report the time was occupied in a discussion of the various phases of the assigned topics. In the session on agriculture, these topics dealt with land and soil resources; crops and forests—their production, protection, and use; farm animals—their breeding, nutrition, and use; labor resources and their use on the land; and economic and social factors in agriculture. In home management, they covered the home management problem; material resources—the management of time, energy, and money in the home; household employment and community resources; and housing for living. The papers on these topics included 8 from the Department, 12 from the land-grant institutions, 11 from other American sources, and 26 from 11 other countries.

In both the Quebec and Washington meetings, much of benefit was derived from the information made available through the papers and their discussion, but perhaps the greatest gain was the more or less intangible advantage of personal acquaintance and informal interchange of ideas. In all these respects both gatherings seem to have been very successful. The International Conference of Agricultural Economists was particularly helpful in bringing together a compact and relatively homogeneous group of specialists and in materially advancing their opportunities for a fuller understanding and a greater cooperation. The Management Congress also achieved much in these directions, but was of added significance as the first international meeting in the Western Hemisphere of a body of economists and business executives in which the interests of the farm and home were recognized as specific integral factors in the national welfare. In many ways the two groups supplemented each other very effectively, and their combined influence should be appreciable and lasting.

At the time of writing, a third gathering of international scope and interest is in progress at Geneva, Switzerland, under the auspices of the League of Nations. This is a meeting of representatives of national nutrition committees. The plan of procedure is for the assembling from time to time in an intensive conference of about a week's duration of a small group of delegates, designated by the participating governments, for the consideration of problems relating to the world's food supply and its most effective utilization. The representative of the United States in the present conference is Miss Sybil L. Smith of the Office of Experiment Stations.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

[**Chemical investigations at the Indiana Station**]. (Partly coop. U. S. D. A.) (*Indiana Sta. Rpt. 1937, pp. 7, 8.*)—An improved method for the determination of acid and base-forming quality of fertilizers is reported upon by L. E. Horat; nonfat constituents of expeller soybean oil, by M. H. Thornton and H. R. Kraybill; carbohydrates of the soybean, by E. D. Walter and Kraybill; variation in composition of commercial soybean oils, by Kraybill and A. W. Kleinsmith; and the effect of tung and Perilla oils on the properties of soybean oil, by M. C. Wang, Thornton, and Kraybill.

Virus proteins: A new group of macromolecules, W. M. STANLEY (*Jour. Phys. Chem., 42 (1938), No. 1, pp. 55–70, figs. 5*).—This is an analytical and critical review of present knowledge on virus proteins, including discussions on their nature, isolation of virus proteins, the question of identity of protein with virus activity, sedimentation constants, shape of the virus molecule, and the theoretical considerations deduced from the factual data presented.

Defining colloidal solutions, H. P. KORTSCHAK (*Hawaii. Planters' Rec. [Hawaii. Sugar Planters' Sta.], 42 (1938), No. 2, pp. 141–145*).—The author points out that the colloidal or noncolloidal properties of a solution are dependent largely upon particle size, which is in itself dependent upon varying factors, including degree of hydration. Properties of "true" and colloidal solutions intergrade in such degree as to make mutually exclusive definitions difficult.

"All the properties that have been mentioned in this discussion are in one way or another connected with the surface of the particles. The fact that sedimentation takes place, instead of a practically instantaneous falling of the particles, is due to friction; Brownian movement is evident only when the moving surface is large enough to be apparent to us; absorption and, in many cases though not always, hydration are determined by properties of the surface. These properties are most evident when particles are so small that the surface area is relatively large, but when they are large enough so that it is possible to conceive the surface as being relatively homogeneous. Thus colloid chemistry is the study of systems where the reactions of surfaces are important, and it is also known by the perhaps better name of surface chemistry."

The chemistry of vitamin A and substances having a vitamin A effect, L. S. PALMER. (Univ. Minn.). (*Jour. Amer. Med. Assoc., 110 (1938), No. 21, pp. 1748–1751*).—The chemical and physiological relations between vitamin A and its precursor carotenoids, α-carotene, β-carotene, γ-carotene, and cryptoxanthin are discussed in this review paper. The author points out that "vitamin A is the only vitamin so far discovered which is a product solely of animal metabolism from precursors which are metabolic products only of plants." The bibliography lists 25 references.

Steps in the concentration of vitamin B_6, G. A. EMERSON, A. MOHAMMAD, O. H. EMERSON, and H. M. EVANS. (Univ. Calif.). (*Jour. Biol. Chem., 124 (1938), No. 2, pp. 377–383*).—The methods for the preparation of 10 vitamin

B_6 concentrates from wheat germ and 6 from cane molasses are described. The preparations, together with 3 from Hawaiian molasses, were assayed on groups of female rats receiving a diet consisting of extracted casein 24 parts, McCollum salt mixture No. 185 4, fresh lard 3, cod-liver oil 2, and sucrose 67 parts, supplemented by 15 μg of thiamine chloride 6 times weekly for 4 weeks until a mild form of the acrodynia type of dermatitis had developed, when 20 μg of riboflavine and 0.5 cc of a liver filtrate equivalent to 5 g of liver and the vitamin B_6 supplements were given 6 times weekly for 30-day and 56-day test periods. The liver filtrate was prepared according to the method described by Lepkovsky et al. (E. S. R., 76, p. 839) except that 6 rather than 5 adsorptions were made on fuller's earth.

The most potent preparation of vitamin B_6 was obtained by readsorption on fuller's earth of a butyl alcohol-extracted picrate prepared from a wheat germ eluate, 0.0025 g of this preparation daily resulting in a gain in weight of 61 g over the control rats in the 30-day period. Highly active preparations were also obtained by the precipitation of the vitamin B_6 as its phosphotungstate or reinecke salt. The molasses, although a rich source of vitamin B_6, did not produce increased growth in proportion to the amounts fed.

The ultraviolet absorption spectra of some monoazo dyes, M. E. Griffith and W. R. Brode (*Ohio Sta. Bimo. Bul. 192 (1938), pp. 122–125, figs. 3*).—The authors show that sulfonic acid groups introduced into the napthalene nucleus usually produce a bathochromic effect which is greatest for dyes from 1-napthol-5-sulfonic acid. The bathochromic effect is very similar with the ortho-, meta-, and parasulfonated diazo components. The intensity of absorption produced was greatest where substitution occurred in the para position of the diazo component. The intensity of absorption appears to be a function of the position of the sulfonic acid groups, "and in many cases there is a similarity between the intensity of absorption and the positions of the bands." It was further observed that "the existence of similar harmonic frequency multiplets in this series where the bands have a simple relation of three, four, and five times the multiple frequency is not as clearly demonstrated here as in the aminoazo series."

A study of indicators for use in the determination of the equivalent acidity and basicity of fertilizers, W. H. Pierre, N. Tully, and H. V. Ashburn. (W. Va. Expt. Sta.). (*Amer. Fert., 87 (1937), No. 5, pp. 24, 26*).—The authors report upon a study of a number of single and mixed indicators that give color changes at pH values near 4.5, the point at which the first hydrogen of phosphoric acid is completely neutralized. A mixed indicator consisting of methyl orange and bromocresol green was found most satisfactory.

A method for studying decomposition of isolated lignin, and the influence of lignin on cellulose decomposition, S. A. Waksman and T. C. Cordon. (N. J. Expt. Stas.). (*Soil Sci., 45 (1938), No. 3, pp. 199–206, fig. 1*).—The procedure described is based upon the solubility of certain forms of lignin in alcohol.

"The lignin is incorporated upon cellulose fibers, and the cellulose-lignin mixture is used as a source of lignin. Lignin thus prepared was found to undergo a certain amount of decomposition by different organisms, at a much slower rate, however, than the decomposition of cellulose. Lignin admixed with cellulose had no injurious effect upon the decomposition of the latter. In natural plant materials, however, especially wood, lignin has a marked retarding effect upon cellulose decomposition. When the lignin is removed, the rate of cellulose decomposition increases. However, even the presence of only 8 percent lignin was sufficient to reduce the rate of decomposition of the cellulose by 50

percent. When the lignin concentration is reduced to 1.5 percent, the cellulose becomes as readily subject to decomposition by micro-organisms as is pure cellulose. The depressing effect of lignin upon cellulose decomposition in plant residues cannot, therefore, be considered to be due to the lignin as such but must be due to the manner of its binding with the cellulose. Whether this binding is chemical or physical in nature, the fact is that it protects the cellulose from rapid attack by saprophytic micro-organisms."

A comparison of methods of determining carbon in soils, C. ESTEVA, JR. (*Jour. Agr. Univ. Puerto Rico [Col. Sta.], 22 (1938), No. 2, pp. 123–136, figs. 3*).—Total carbon was determined in 25 samples of soil. The Official wet oxidation method gave results which compared favorably with those obtained by S. Waterman[1] with the Parr dry combustion method (E. S. R., 15, p. 846). The chromic acid method of White and Holben (E. S. R., 53, p. 714) gave consistently low results.

The determination of ammonia and urea in milk, A. E. PERKINS (*Ohio Sta. Bul. 592 (1938), p. 82*).—A simple method is described.

The pasteurization of apple juice, D. K. TRESSLER and C. S. PEDERSON (*New York State Sta. Circ. 181 (1938), pp. 16, figs. 7*).—Both cloudy and clarified apple juice may be preserved by flash pasteurization. This method of preservation is a considerable improvement over methods heretofore proposed, in that the aroma, flavor, and appearance of the juice are not modified materially. The procedure involves merely the passage of the juice through a heated coil of tubing. The hot juice is packed either in enamel-lined cans or in bottles, which are immediately closed, inverted, or turned on their sides for 3 min. and then quickly cooled. Clarified juice may be satisfactorily preserved by either flash or holding pasteurization.

A simple inexpensive flash pasteurizer which may be built at a cost of approximately $15 is described.

The flash pasteurization of apple juice preserves natural flavor, D. K. TRESSLER and C. S. PEDERSON (*Farm Res. [New York State Sta.], 4 (1938), No. 3, p. 12, fig. 1*).—A brief statement of the main results noted in Circular 181.

Cherry juice and cherry beverages, D. K. TRESSLER (*New York State Sta. Circ. 180 (1938), pp. 4*).—This circular briefly describes the special equipment necessary because of the high acidity of cherry juice, and takes up hot and cold pressing, sweetening and dilution, pasteurization and bottling, and uses.

Cherry juice is rapidly gaining in favor as a sprightly beverage, D. K. TRESSLER (*Farm Res. [New York State Sta.], 4 (1938), No. 3, pp. 1, 4*).—Essentially noted above.

[Studies in rum manufacture], R. ARROYO (*Puerto Rico Col. Sta. Rpt. 1937, pp. 75, 76*).—Work on fermentation and distillation in the manufacture of rum is briefly noted.

A weather-resistant fireproofing treatment for cotton fabrics, M. LEATHERMAN (*U. S. Dept. Agr. Circ. 466 (1938), pp. 18, fig. 1*).—The author precipitated stannic oxide from sodium stannate solutions in the fabric by means of ferric sulfate solution, thereby largely inhibiting the destructive action of stannic oxide on fabric during exposure to sunlight. Fabrics thus treated were "flame proof" but not "fireproof," in that flameless combustion (glowing or smoldering) was not prevented.

To prevent the glowing, so as to make the fabric completely fireproof, a fireproofing resin was prepared by chlorinating practically to saturation a mixture of paraffin with a heavy petroleum oil, both being dissolved in carbon tetra-

[1] The carbon nitrogen ratio in soils, 1925 (unpublished thesis).

chloride during the chlorination. "This resin evolves hydrogen chloride at the combustion temperature of cellulose, which prevents the afterglow induced by stannic oxide. The resin acts as a supplementary fireproofing agent. The part played by the chlorinated resin is compared with the fireproofing action of the ammonium salts, and the limitations of the chlorinated resin are explained on the basis of the decomposition temperatures of the two materials."

The chlorination method is briefly described with respect to raw material, apparatus, and control of the chlorinating process. The use and function of plasticizers are discussed, and the method of applying the resin to fabric is described. The treated fabric was completely fireproof after 6 months' exposure to the weather.

AGRICULTURAL METEOROLOGY

Monthly Weather Review, [March–April 1938] (*U. S. Mo. Weather Rev., 66 (1938), Nos. 3, pp. 63–91, pls. 10, figs. 10; 4, pp. 93–116, pls. 8, figs. 4*).—In addition to the usual detailed summaries of climatological data, solar and aerological observations, observations on weather on the Atlantic and Pacific Oceans and on rivers and floods, and bibliographical and other information, these numbers contain the article noted on page 585, and the following contributions:

No. 3.—On the Thermodynamic Interpretation of Isentropic Charts, by H. R. Byers (pp. 63–68); and Relation of Pressure Tendencies to Cyclones and Fronts, by W. R. Stevens (pp. 68–70).

No. 4.—Report on the Weather Bureau Radiometeorograph Program, by L. T. Samuels (pp. 93–95); and Record-Breaking Annual Precipitation, 1846–1850, by L. J. Guthrie (pp. 95–96).

Classifications and indexes of climate in relation to forest growth in Italy [trans. title], A. DE PHILIPPIS (*Nuovo Gior. Bot. Ital., n. ser., 44 (1937), No. 1, pp. 1–169, pls. 4, figs. 18, Eng., Ger., Ital. abs., pp. 166–169; abs. in Ann. Agron. [Paris], n. ser., 8 (1938), No. 2, pp. 283, 284*).—The purpose of this study was to determine the best methods of defining climatically forest zones in Italy. The report discusses the best known systems of classification and synthesis and describes the characteristic aspects of the dominant types of Italy. An extensive bibliography is appended.

Evaporation studies.—II, The influence of pan color on evaporation, J. D. WILSON and C. A. PATTON (*Ohio Sta. Bimo. Bul. 192 (1938), pp. 118–120*).—Continuing this series (E. S. R., 77, p. 481), considerably more water was lost from the black than from the white pan. The differences were of the same order as for the radiant energy factor, but were less marked than those between black and white atmometers and made up a smaller percentage of the total loss due to all factors. Losses from the galvanized pan corresponded more closely to those from the black than from the white pan, indicating the galvanized iron to be very efficient in absorbing radiant energy.

Hurricanes: Their nature and history, particularly those of the West Indies and the southern coasts of the United States, I. R. TANNEHILL (*Princeton, N. J.: Princeton Univ. Press; London: Oxford Univ. Press, 1938, pp. X+257, figs. 114*).—It is stated in the preface that "an attempt has been made to set down in this book, in popular language, all the essential facts and theories regarding the tropical cyclone and all the known history that is worth mentioning of the hurricanes of the West Indies, the United States, and adjacent waters of the Atlantic Ocean, the Gulf of Mexico, and the Caribbean Sea. The book has been so arranged that when the reader has found what he wishes to know about the nature of the tropical cyclone, he may obtain from the historical section an account, or at least a reference to the occurrence, of every hurricane

known to have visited the locality in which he may be interested." After an introduction dealing in general with tropical cyclones—their history, nature, and observation—there follow chapters on winds of the hurricane, the storm wave, origin of West Indian hurricanes, hurricane tracks, rainfall in tropical cyclones, barometric pressures, signs of the approaching hurricane, unusual hurricane movements, frequency of West Indian hurricanes, destructive effects of hurricanes, precautionary measures, early history of West Indian hurricanes, memorable hurricanes of the nineteenth century, a chronological account of hurricanes of the twentieth century, and a chronological list of hurricanes, 1494–1900.

It is stated that "there is good evidence that the frequency of West Indian hurricanes has not changed materially since the days of Columbus. In some years of the present century there have been many and in others few, as was evidently the case in earlier centuries. From 1901 to 1937, with fairly good records of tropical cyclones in the Atlantic Ocean, Gulf of Mexico, and Caribbean Sea, the variation from year to year is indicated by the maximum number, 21 in 1933, and the minimum, 2 in each 5 yrs., 1911, 1914, 1917, 1929, and 1930." The apparent increase in frequency of tropical storms in recent meteorological history "is partially a reflection of the growth of facilities for reporting them."

A considerable bibliography is appended.

The amount of dust in the air at plant height during wind storms at Goodwell, Oklahoma, in 1936–1937, W. H. Langham, R. L. Foster, and H. A. Daniel. (Okla. Expt. Sta.). (*Jour. Amer. Soc. Agron., 30 (1938), No. 2, pp. 139–144, figs. 2*).—Measurements were made with an impinger tube to determine the amount of dust per cubic foot of air at various times during 29 dust storms of 1936 and 1937 occurring at Goodwell. The average amount of dust collected in all storms was 33±14 mg per cubic foot of air. The average wind velocity during these storms was 23.2±2.5 miles per hour.

A record of the number of dusty days occurring at Goodwell from January 1, 1933, to August 1, 1937, shows that there were 70 dusty days in 1933, 22 in 1934, 53 in 1935, 73 in 1936, and 117 from January 1 to August 1, 1937.

The chemical content of Oklahoma rainfall, V. G. Heller (*Oklahoma Sta. Tech. Bul. 1 (1938), pp. 23*).—Nitrogen brought down by rainfall in the form of ammonia reached its maximum in the spring, was lower during the summer, and rose again in the early fall. Nitrate nitrogen increased after electrical disturbances, especially during the month of September. The content of nitrite nitrogen was usually small.

The chloride content appeared to be greater in the spring and fall, varying with the direction of the wind and the location.

The sulfates were "surprisingly high" and varied a great deal with the location and time of year. Samples collected at industrial centers were of uniformly higher sulfate, suggesting contamination from fumes of burning oil, gas, or coal.

The greater percentage of chemical content was found in the limited rainfall after prolonged dry periods, after dust storms, and near industrial centers.

Temperature changes in North and South Carolina, E. C. Thom (*U. S. Mo. Weather Rev., 66 (1938), No. 3, pp. 70–73, figs. 2*).—Based on an 8-yr. study (1928–35), it is indicated that significant changes are most frequent from November to February, are uncommon from June to August, and in most months are more frequent in the areas of higher elevation in the western parts of these States. Significant first-period (8 a. m. to 8 a. m.) changes may be expected on nearly 6 out of 10 days in the months of November to February in North Carolina, and on slightly over 3 out of 10 days in the same months in South

Carolina. In these States a significant temperature change occurs on only 1 out of 10 days in the summer, first or second (8 p. m. to 8 p. m.) period. Large changes are more likely to occur with falling than with rising temperatures.

[**Meteorological data for Ohio**] (*Ohio Sta. Bul. 592 (1938), pp. 37, 136–141*).—Data are presented on evaporation at Wooster in 1937, by J. D. Wilson; a climatological summary for 1936, by C. A. Patton; and tabulations of miscellaneous observations at Wooster and other points in the State.

SOILS—FERTILIZERS

[**Soil investigations by the Indiana Station**] (*Indiana Sta. Rpt. 1937, pp. 15, 16, 22, 23, 24, 27, 28, 79, figs. 2*).—These have included work on fertility value of cornstalks burned v. plowed under, by R. R. Mulvey; soil tests for farmers, and neutralizing value of marl and limestone from local beds and quarries, both by S. F. Thornton, R. A. Weaver, and O. Cudworth; the effect of season of the year on the results of rapid chemical soil tests, by Thornton and A. P. Bell; nutrient deficiency symptoms, by Thornton; soil erosion control, by I. D. Mayer and G. P. Walker; and comparison of different phosphates.

[**Soil investigations by the Ohio Station**] (*Ohio Sta. Bul. 592 (1938), pp. 19–21, 26, 27, 56, 57–59, 60, 71, fig. 1*).—The report briefly notes the soil losses from fertility experiment plats, by G. W. Conrey and E. M. Burrage; the ineffectiveness of manganese, copper, magnesium, zinc, boron, and sulfur in preliminary tests, by E. E. Barnes; effect of turf and soil type on rate of loss of soil moisture, by F. A. Welton and J. D. Wilson; potash studies in orchard soils, and the quantitative determination of potassium in plant tissues by means of the spectrograph, both by Wander and J. H. Gourley; porosity and organic matter content of an orchard soil, by L. Havis and Gourley; soil acidity studies in the orchard, by Gourley and Allmendinger; and manufacture of artificial manure from straw, by A. Laurie.

[**Soil investigations by the Wisconsin Station**], A. R. ALBERT (*Wisconsin Sta. Bul. 440 (1938), pp. 80–83, figs. 2*).—Means for lessening frost damage on the northern lowlands and the fertilizer requirements of peat soils are briefly discussed.

A device for the rapid collection of surface-inch soil samples, L. WOODWARD and D. A. ANDERSON. (U. S. D. A.). (*Jour. Amer. Soc. Agron., 30 (1938), No. 2, pp. 162, 163, fig. 1*).—The authors devised a sampling tool of the nature of a flat trowel, to which have been added vertical sides 1 in. high. The point is cut at an obtuse angle and sharpened at the edges. Automobile fender steel of from 18 to 22 gage was found to be a suitable material. A dimensioned drawing accompanies the note.

Adaptation of the hydrometer method to aggregate analysis of soils, R. W. GERDEL. (Ohio Expt. Sta. and U. S. D. A.) (*Jour. Amer. Soc. Agron., 30 (1938), No. 2, pp. 107–110, fig. 1*).—In a procedure based upon the method of Bouyoucos (E. S. R., 57, p. 710), a series of 50-g aliquots are weighed out from each soil sample and permitted to slake under water for at least 30 min. On one aliquot the particle-size distribution is determined by the regular Bouyoucos method. Successive aliquots undergo 2, 4, 6, 8, and 10 minutes' stirring in the Bouyoucos electric mixer without the addition of any dispersion reagent. If 10 min. of stirring without the use of dispersing agents does not yield a reading of clay as large as that of the chemically dispersed aliquots, then a series of aliquots receiving a total of 2, 4, 6, or 8 cc of the dispersion reagents are each stirred for 10 min. The dispersing solutions, sodium silicate and sodium oxalate, are added in equal volumes. Some one of these treatments

will result in complete dispersion of the aggregates. Another aliquot is transferred to the hydrometer cylinder after slaking and is gently shaken for 2 min.

"Although it has been found that considerable variation in the amount of shaking may not have any appreciable effect upon the aggregated particles . . . it appears advisable to treat all samples similarly. Satisfactory results have been obtained by inverting the cylinder at 5-sec. intervals for 1.5 min., and then at 1-sec. interval for 30 sec. Hydrometer readings are then made at 40 sec. and at 1 hr."

[Soil survey Reports, 1930, 1932, and 1934 Series] (*U. S. Dept. Agr., Bur. Chem. and Soils* [*Soil Survey Rpts.*], *Ser. 1930, No. 48, pp. 57, figs. 3, map 1; 1932, Nos. 22, pp. 54, pls. 2, figs. 3, map 1; 24, pp. 35, pls. 3, figs. 2, map 1; 25, pp. 31, figs. 2, map 1; 26, pp. 60, figs. 3, map 1; 1934, No. 5, pp. 56, figs. 2, map 1*).—Except as indicated below, these surveys were made in cooperation with the respective State experiment stations: 1930, No. 48, Licking County, Ohio, R. Wildermuth et al.; 1932, Nos. 22, Dallas County, Ala., W. J. Moran et al., and 26, Wilcox County, Ala., G. A. Swenson et al. (both with Ala. Dept. Agr. and Indus.), 24, Kingman County, Kans., E. W. Knobel et al., and 25, Wayne County, Pa., C. S. Simmons et al.; and 1934, No. 5, Halifax County, Va., R. C. Jurney et al.

Studies in electrodialysis of soils.—III, Speed of electrodialysis of various cations, A. N. PURI and R. C. HOON (*Soil Sci., 45 (1938), No. 4, pp. 309–313*).—The authors of this series (E. S. R., 78, p. 592) studied the electrodialysis of soil artificially saturated with single bases and obtained experimental evidence in support of the hypothesis that differences in the rate of electrodialysis of different cations in soils are due to the differences in their ionic activities. It is pointed out that "such differences would come into play only in the case of salts of insoluble acids such as aluminosilicates."

Oxidation-reduction potentials in orchard soils, R. E. STEPHENSON, C. E. SCHUSTER, and J. SPULNIK. (Oreg. Expt. Sta.). (*Jour. Amer. Soc. Agron., 30 (1938), No. 2, pp. 91–96*).—Seven soil series (Melbourne, Salkum, Newberg, Carlton, Williamette, Chehalis, and Wapato) showed little difference in oxidation-reduction potential with the methods used. The various horizons of the soil, even where there was a tight subsoil, also showed little variation in oxidation-reduction potential. Fresh organic matter alone in moist soil did not cause a fall in the potential but with a waterlogged condition caused a rapid fall. On the basis of these and similar observations, the authors state that "the oxidation-reduction potential is not a dependable indication of anaerobic conditions in the soil."

The cycle of weathering, B. B. POLYNOV, trans. by A. MUIR (*London: Thomas Murby & Co., 1937, pp. XII+220, figs. 4*).—This important book is a study of the "fundamental raw material of the soil." A foreword by W. G. Ogg states that "scattered data existed in many geological and other textbooks, but in this work Prof. Polynov has brought these together and has added the results of his own extensive researches. He has traced the cycles of the various elements in the crust of weathering and has developed a philosophy of the weathering processes which will undoubtedly prove a great stimulation to soil research. It is likely to provide the basis for a more satisfactory system of soil classification and to put soil investigations on a more satisfactory scientific basis."

The contents deal with the earth's crust and the crust of weathering; the oxygen, carbon, and nitrogen cycles in the crust of weathering; the silicon, aluminum, and iron cycles; the cycles of the alkali and alkaline earth metals, chlorine, sulfur, and phosphorus; forms of the crust of weathering and their distribution; a "note on the structure of silicates," by Muir, and subject and author indexes.

Chemical and physical properties of certain soils developed from granitic materials in New England and the Piedmont, and of their colloids, I. C. Brown and H. G. Byers (*U. S. Dept. Agr., Tech. Bul. 609 (1938), pp. 56*).—The Brassua series, Podzols recently differentiated by profile distinction from the Hermon series and similar to them but further developed, has been evolved on gentle slopes of high plateaus and mountains of northern New England from granitic and gneissic glacial tills. The sandy loams of these two soils were obtained in Grafton County, N. H. The Gloucester series, Gray-Brown Podzolic soils of rolling relief and good drainage, contains soils developed from glacial till. Gloucester sandy loam was sampled in Norfolk County, Mass., and in northern New Jersey. The Chester series, mature Gray-Brown Podzolic soils, developed from Piedmont Plateau crystalline rock material from New Jersey to North Carolina, is here represented by Chester loam from Montgomery County, Md. Manor loam, sampled in Fairfax County, Va., represents a series similar to the Chester soils, except that most or all of the surface layers have been removed by surface drainage erosion. The Cecil series, of the Red and Yellow soil group, is here represented by a sandy clay loam from the erosion experiment station, North Carolina. The Appling series includes gray soils of imperfect drainage, in the Piedmont region, and was sampled, as Appling sandy loam, in Elbert County, Ga.

The laboratory determinations include pH values, soluble salts, mechanical and chemical analyses of the soil, chemical analyses of the extracted colloids, and the water vapor absorbed by them at 99-, 75-, and 50-percent humidities. The analytical results and derived data are discussed in connection with the chemical and other characteristics of each profile as affected by climate, vegetation, drainage, etc. This is followed by a general discussion of the relationships of the whole group, accompanied by tables of summarizing data bearing on the composition and constitution of the colloids.

It is shown that the colloids of soils derived from glacial drift have been fractionated extremely during profile development: those derived from older parent material have not. The Brassua, Hermon, and two Gloucester soils are highly podzolized; the Chester, Manor, Cecil, and Appling are lateritic. The dominant soil-forming process of each group is hydrolysis; it is influenced by the parent material and intensified by an increase in the mean annual temperature. Extreme variation of the colloid composition in the profiles is not always indicated by the morphology of the soil.

The carbon: nitrogen ratios of the Gray-Brown Podzolics and lateritic soils and their colloids usually decrease with depth. The ratio is as high as 45 in the Podzols and lower than 10 in the colloids of some of the lateritic soils; the ratio for the colloids is usually much less than that of the soils.

The colloids of the B layers in general absorb more water vapor than those of the A or C, but the hygroscopicities approach the same values at the lower humidities in all but the Podzols. At 75- and 50-percent humidities the water vapor absorbed by the colloids of the more southerly soils is less than that absorbed by the colloids farther north. The ratio of water absorbed at 99- and 75-percent humidities is indicative of the great soil groups. From north to south for each profile the average is: Podzols, 1.77 and 1.45; Gray-Brown Podzolics, 1.96, 3.27, 2.71, and 2.85; the lateritics, 7.38 and 5.8. At low humidities the ratios approach uniformity. The average is 1.39.

It is inferred from the data "that the following soil acids identify the colloids: The A horizon of the Podzols, pyrophyllic acid; the surface layer of the Gloucester from Massachusetts and all layers of the Chester, Manor, and Appling, halloysitic acid; the surface layer of the Gloucester from New Jersey, the B and C layers of

the Appling, all horizons of the Cecil, and the C layers of the Podzols, allophanic acid. The presence of free alumina is indicated in the B layers of the podzolized glacial soil colloids."

In the soils of New England and the Piedmont, environmental conditions tend to produce colloids of a wide range of composition. Parent material, temperature, rainfall, and vegetation are the primary factors affecting the composition.

Sand dunes of recent origin in the southern Great Plains, C. J. WHITFIELD. (U. S. D. A.). (*Jour. Agr. Res.* [*U. S.*], *56* (*1938*), *No. 12, pp. 907–917, figs. 7*).—Erosion hazards in the form of sand dunes have developed in recent years on large areas of land throughout the Great Plains.

It was found that the sand dunes could be effectively lowered by utilizing the force of the wind to redistribute the materials that this same force had built up into dunes (the most practical of various effective methods being apparently, the use of the drag pole to cut off the crest of the dune) and that over most of the area a sufficient cover crop could be produced to protect the soil adequately against further erosion.

This study indicates that the better land is capable of producing good crops of grain sorghums if farmed in such a way as to prevent soil drifts, and also that these dune sites can be returned to grass.

Contrasts between the soil profiles developed under pines and hardwoods, P. R. GAST (*Soil Sci. Soc. Amer. Proc.*, *1* (*1936*), *p. 347*).—The author reports, from the Harvard Forest, observations on soil profiles during the succession (1) tillage and pasturage, (2) old field white pine, and (3) hardwood, this succession being characteristic of abandoned lands in central New England.

"The change in the soil profile is brought about largely by the action of the soil fauna, of which the angleworms are the most important. Under trees whose leaves are a preferred food are found the greatest increases in the depth of the soil enriched by organic matter. Simultaneously, as a result of the continuous overturn by worms, the stratification in the soil brought about by podzolization is ultimately eliminated."

It is suggested that the extent of this mechanical action should be the criterion for the distinction between the mull and mor groups of forest humus types. The observed soil changes under alternating forest cover types were sufficiently marked to raise the question whether or not such changes may confuse soil type identifications or even "contribute to the formation of 'young' or the failure to develop 'normal' profiles."

Nomenclature of forest humus layers, S. O. HEIBERG (*Soil Sci. Soc. Amer. Proc.*, *1* (*1936*), *pp. 355, 356*).—The author recognizes but two main species of forest humus, namely, "mull" and "mor." He subdivides these into coarse mull, fine mull, and firm mull, and granular mor, greasy mor, and fibrous mor.

The presence of allantoin in soils, E. C. SHOREY. (U. S. D. A.). (*Soil Sci.*, *45* (*1938*), *No. 3, pp. 177–183, pl. 1*).—Crystalline allantoin, showing a nitrogen content of 35 and 35.3 percent (as against 35.4 percent theoretical) in duplicate micro-Kjeldahl determinations and agreeing with the known properties of pure allantoin in crystalline form, solubilities, melting point, and reaction with Schiff's reagent, has been isolated from the water extracts of Carihou loam (Maine), Norfolk sand (South Carolina), Norfolk fine sand (Virginia), and "a so-called Glade soil" (Florida).

Kilogram lots of soil were extracted with distilled water either at room temperature or at a temperature not over 80° C. The water extract was treated with a solution of mercuric nitrate. This produced a flocculent precipitate, removing the slight yellow color of the extract. An excess of the reagent was then added, and the precipitate was removed by decantation or filtration. To

the filtrate a dilute solution of sodium hydroxide was added until the white precipitate first formed became yellow, the solution being still acid. Both precipitates, after being washed, were suspended in water, heated to boiling, and treated with hydrogen sulfide to complete precipitation of the mercury as sulfide, and the filtrates from sulfide were evaporated almost to dryness on a steam bath. The residue so obtained was partly crystalline, although that from the first precipitate contained considerable amorphous colored material, which apparently prevented or made difficult crystallization. This partly crystalline material was washed well with absolute alcohol, taken up in hot water, filtered, and evaporated again to the crystallizing point. This operation was repeated several times until crystals of allantoin deposited on cooling of the hot solution.

Some influences of the development of higher plants upon the micro-organisms in the soil.—VI, Microscopic examination of the rhizosphere, R. L. STARKEY. (N. J. Expt. Stas.). *(Soil Sci., 45 (1938), No. 3, pp. 207–249, pls. 11).*—In the present contribution (E. S. R., 66, p. 317), the author describes observations made by the buried slide method. The method proved to be useful for demonstrating some of the colony formations and growth characteristics of various soil micro-organisms. Some of the organisms which developed in response to root growth and the types of microbial formations on root hairs were readily observed.

As had also been determined by the plate method, microbial development was found to be much more extensive about roots than elsewhere in the soil. "The effect of roots is rather local, a large portion of the organisms developing in close contact with the roots and root hairs. The mycelium of the filamentous fungi may spread for some distance from the organic matter which is being decomposed. Small coccoid bacteria commonly appear in abundance on the fungus mycelium. Bacteria were found as scattered cells and in small aggregates about root hairs, conidial fragments and filaments of actinomycetes were recognized, and branched filaments and scattered spores of filamentous fungi were seen."

The nature of the observations made possible by this method is illustrated in 68 photomicrographs.

Microbial activities in soil.—III, Activity of specific groups of microbes in different soils, S. C. VANDECAVEYE and G. O. BAKER. (Wash. Expt. Sta.). *(Soil Sci., 45 (1938), No. 4, pp. 315–333, figs. 10).*—The authors carried out, in the third of this series (E. S. R., 74, p. 460), a study of the rate of decomposition of different kinds of plant residues and their influence on the microbial activity in the Palouse and Melbourne silt loams. The plant residues were supplemented with ammonium nitrate sufficient to make the total supply of nitrogen equivalent to 3.18 percent of their dry weight. The rate of decomposition was ascertained by periodical measurement of carbon dioxide evolution and nitrate nitrogen accumulation, and the microbial activity by periodical plate counts for bacteria, actinomyces, fungi, aerobic cellulose-decomposing bacteria, and *Azotobacter*.

A distinct difference was found in the native microflora of the two soils. The total number of microbes was about five times as large in the Palouse soil, which contained 4.4 percent of organic matter, as it was in the Melbourne soil, which had an organic matter content of 8.1 percent. The microflora of the Palouse soil consisted of a relatively large number of bacteria and actinomyces and a very small number of fungi, whereas that of the Melbourne soil was composed of approximately seven times as many fungi and only about one-sixth as many bacteria and actinomyces as that of the Palouse soil.

The addition of 1 percent of wheat straw and sweetclover hay, respectively, caused a marked increase in microbial activity in both soils, as did the addition

of like amounts of pine needles and coniferous forest duff to the Palouse soil. All groups except the cellulose-decomposing bacteria and the *Azotobacter* were affected. The numbers in the latter two groups were very small and their activity not significant. Although the activity of the same specific groups of organisms in the two soils was not affected alike by the same plant residue, and the influence of different residues on the activity of the various groups of microbes in both soils varied, the relative order of predominance of specific groups of microbes in each of the two soils remained similar. This predominance appeared to be controlled to a greater extent by specific inherent soil characteristics than by the nature of the organic food supplied by the plant residues. The less numerous microflora in the Melbourne soil was capable of decomposing the added organic residues about as rapidly as was the more numerous microflora in the Palouse soil.

Increased rates of CO_2 evolution did not coincide with increased microbial numbers as indicated by plate counts. On the contrary, the maximum CO_2 production resulting from the addition of plant residues preceded the maximum numbers of microbes by a period of about 15 days, and a second peak in microbial numbers developed at a time when the rate of CO_2 evolution was very low.

The reaction of the variously treated soil samples became gradually more acid. The change in reaction coincided roughly with progressive accumulations of NO_3 in the soil. A small decrease in total nitrogen, which could not be accounted for by escaping ammonia through the CO_2 absorption train, took place in all the samples.

Distribution of legume bacteria in the Piedmont soils of South Carolina, T. C. PEELE and J. K. WILSON (*South Carolina Sta. Bul. 314 (1938), pp. 14*).—It is shown that the soils of the Piedmont Plateau soil province are very deficient in legume bacteria. The badly eroded areas are more deficient in soybean, vetch, locust, and lespedeza organisms than are adjoining, relatively noneroded areas.

"Inoculation of legume seeds would be expected to result in increased crop yields in view of the findings of this investigation. In order to obtain the maximum benefit from legume bacteria the soils should be limed when necessary to produce a favorable reaction and such other soil amendments made as may be required to produce favorable physiological conditions for the development of both the bacteria and the legumes."

Cover crops and soil moisture, R. E. STEPHENSON. (Oreg. State Col.). (*Oreg. State Hort. Soc. Ann. Rpt., 27 (1935), pp. 168–174*).—The author finds that "cover crops can be successfully grown on the better valley floor soils with little difficulty. There is no difficulty where irrigation can be practiced. Soil-building crops must be grown on hill soils where orchards are to continue productive. The grower on the hill soil is justified in expending considerable effort and some money to grow better cover crops. He can afford to fertilize to insure good growth. But whatever else occurs, the cover crop must be worked into the soil early (about the first half of April) before the soil is robbed of its moisture."

Controlling soil erosion in Northern States, A. F. GUSTAFSON. (N. Y. State Expt. Sta.). (*Better Crops With Plant Food, 21 (1937), No. 8, pp. 9–11, 39, 40, figs. 2*).—This article points out that "moderate slopes may be cultivated safely if recognized soil erosion control methods are practiced," and details 11 important and practicable precautionary and remedial measures upon which such cultivation should be based. The value of phosphates in encouraging the development of bulky root systems is one of the useful practices here emphasized. Leaving grass in the waterways of sloping lands is also shown to be of value.

[Erosion control and ground water conservation investigations by the Wisconsin Station]. (Coop. U. S. D. A.). (*Wisconsin Sta. Bul. 440 (1938), pp. 87–90, figs. 2*).—Progress results are briefly reported by O. E. Hays, indicating that soil conservation practices maintain crop returns; and by H. F. Scholz, to the effect that woodlands with a good supply of litter on the ground absorb enough moisture to add appreciably to the supply of ground water.

Conditions in the so-called dust bowl as revealed by a recent soil conservation survey, A. H. JOEL. (U. S. D. A.). (*Soil Sci. Soc. Amer. Proc., 1 (1936), pp. 343, 344*).—According to a report from Salt Lake City, Utah, based on a detailed reconnaissance survey, a total of 53.4 percent of the surveyed area has been affected by all types of accelerated erosion to a serious degree (42.5 percent by wind erosion). A total of 91.6 percent of all serious erosion has been by wind, of which combined removal and accumulation is by far the most important type. Water erosion is relatively unimportant, only 4.4 percent of the area having been affected to a serious degree. However, there is frequently heavy loss of moisture through excessive run-off, and the need for moisture conservation is, therefore, urgent.

That portion of the recommended remedial program dealing with better land use includes "at least the following: (1) The permanent removal of certain lands from cultivation, the adoption of proper measures for sound land use for these lands, and proper assistance to the people affected by such adjustment; (2) the reorganization of the whole affected region in such a way as to provide for the soundest type of production, considering permanency, stability, and economic feasibility of production; (3) the adoption and general practice on lands kept in cultivation of farming methods well adapted to the region, as demonstrated by research and experience; (4) the enlistment of the advice and cooperation of the best practical farmers in each community affected to assist in making the necessary adjustment; [and] (5) the coordination of efforts of all individuals and agencies involved in making the readjustments."

Soil fertility investigations, H. H. KRUSEKOPF (*Missouri Sta. Buls. 395 (1938), pp. 15, figs. 3; 396, pp. 11, figs. 2*).—These two bulletins (No. 395, Brown Limestone Land of Southwestern Missouri, and No. 396, Rolling Prairie Land of Southwestern Missouri) report upon cropping-system and fertilizer-treatment experiments of the usual type, carried out on the Newtonia and Eldorado Springs experiment fields, respectively. One experiment dealt with in Bulletin 395 takes up the value of wheat straw as a fertilizer.

Fertility experiments on Sassafras silt loam, G. L. SCHUSTER and C. E. PHILLIPS (*Delaware Sta. Bul. 209 (1938), pp. 34, figs. 9*).—Field plat experiments begun in 1907 and reported upon in 1924 (E. S. R., 51, p. 621) have been continued, and results through 1935 are reported with the following conclusions: Potassium was the limiting factor in the production of corn and soybeans under the conditions of these experiments. Phosphoric acid was the limiting factor in the production of wheat and hay. The phosphoric acid-potassium combination was almost as good as a complete fertilizer on all crops. Applications of manure were as good as, if not better than, a complete fertilizer for corn production. Lime did not increase the yields of corn or soybeans except where potash was applied. Lime produced favorable results on the hay crop. The greatest gains were made when lime was used in connection with phosphoric acid.

A liberal use of plant nutrients was necessary to produce and maintain maximum yields. Any marked decrease in the amount of plant nutrients applied was inevitably followed by a marked decline in yields.

***Mitscherlich's pot method for soil fertility,* based on studies of a single limiting nutrient factor supplemented by field experimentation,** J. AMÉDÉE

BONNET (*Puerto Rico Col. Sta. Rpt. 1937, pp. 80, 81*).—Results of pot experiments are noted.

A modification of Mitscherlich's method for the determination of the nutrient contents of a soil, B. G. CAPÓ (*Jour. Agr. Univ. Puerto Rico* [*Col. Sta.*], *22* (*1938*), *No. 2, pp. 137–169, figs. 15*).—The author finds that Mitscherlich's special equation for the relation existing between the initial nutrient concentration of a single nutrient in a soil and the yield of a crop there planted is accurate and simple, and that such an equation may be used to determine with a high precision the available amount of any nutrient in a given soil. Mitscherlich's general equation relating the yield of a crop with the initial concentrations of the three principal nutrients (nitrogen, phosphoric acid, and potash) was found not to hold, however; and his four-treatment method, based on the applicability of this latter equation, is not accurate under Puerto Rican conditions for the vegetative period of growth of a crop, that is, from the time of planting to the time of heading. A modification of the method, including seven treatments and based on the applicability of the Mitscherlich's special equations for variations in the concentrations of each individual nutrient respectively, is described as now used.

Effect of long continued treatment on the organic matter, nitrogen, and phosphorus content of Clarion loam.—I, Continuous corn, F. B. SMITH, P. E. BROWN, and W. J. PEEVY. (Iowa Expt. Sta.). (*Iowa State Col. Jour. Sci., 11* (*1937*), *No. 4, pp. 379–395, figs. 4*).—In the experiments here reported the organic matter, nitrogen, and phosphorus in the soils in all plats decreased from 1917 to 1936, except in the soil which received a treatment of lime alone. Here the organic matter was increased slightly. The largest decrease in organic matter occurred in the soil which had received applications of manure and lime. In all but one case the loss in organic matter was greatest in those soils which contained the greatest proportion at the beginning of the experiment. Only in the soil which received lime alone was it found that this did not hold true.

The addition of manure to the acid soil reduced the loss of organic matter and nitrogen, while the addition of manure and lime decreased the loss of nitrogen. The addition of manure alone or lime alone decreased the amount of available phosphorus in the soil, whereas the addition of both manure and lime increased the amount present. The results indicate that lime tended to conserve the organic matter, nitrogen, and phosphorus of the soil which received lime alone, "although the results were not conclusive."

Machine placement and soil disturbance studies in Texas, 1937, H. P. SMITH. (Tex. Expt. Sta.) (*Natl. Joint Com. Fert. Appl. Proc., 13* (*1937*), *pp. 73, 74*).—This is a summary of results obtained in 1937 at College Station and Nacogdoches where fertilizer was applied both under the seed and to the side of and below the seed level. For each test a check was planted, disturbing the soil but not applying any fertilizers.

Changes in composition of granular and powdered fertilizers in the soil, C. B. SAYRE and A. W. CLARK. (N. Y. State Expt. Sta.) (*Jour. Amer. Soc. Agron., 30* (*1938*), *No. 1, pp. 30–37*).—The authors overcame the difficulty introduced by contamination of the fertilizer samples with the soil with which they had been in contact (E. S. R., 74, p. 607) by placing fertilizers in bands about 2 in. wide and ¼ in. thick between strips of Monel metal wire cloth buried in the soil 4 in. deep, so that the fertilizers would be exposed to the natural action of the soil solution yet could be recovered later without appreciable contamination. Three different fertilizer mixtures, each in powdered form and in three sizes of granules, were used in this test.

Also, "although powdered fertilizers could not be cleanly recovered after being in direct contact with the soil, it was possible after a great deal of careful and tedious work with tweezers to recover granulated fertilizer that had been in intimate contact with the soil." Two fertilizers, one having all its nitrogen in the mineral form and the other with 25 percent of its total nitrogen in organic combination, were recovered in this way after 14 weeks' contact with the soil. The first fertilizer, which originally contained 4.92 percent of nitrogen, showed only 0.09 percent nitrogen, while the second, which originally contained 4.82 percent nitrogen, showed after 14 weeks' contact 0.57 percent. The percentage of available phosphoric acid, as determined by the neutral ammonium citrate method of the A. O. A. C., remaining in these granulated fertilizers was remarkably high when it is considered that this Ontario loam soil has a high capacity for phosphorus fixation. The fertilizers originally contained 10.42 and 10.62 percent available P_2O_5, and still contained 9.73 and 9.28 percent available P_2O_5, respectively, after the granules had been mixed with the soil for 14 weeks. The percentage of insoluble P_2O_5 in these fertilizers, originally only 0.08 and 0.04 percent, increased to 1.53 and 0.9 percent, respectively.

The potassium salts were found to have dissolved out from the granulated fertilizer in direct contact with the soil very rapidly. Potassium disappeared distinctly less rapidly from the layers of fertilizer exposed between Monel wire cloth screens. Otherwise the fertilizer placed between the metal cloth screens was acted upon in very much the same way as that directly exposed to the soil as well as the soil solution.

Mineral fertilizers for pasture improvement, H. B. Sprague. (N. J. Expt. Stas.). (*Better Crops With Plant Food, 21 (1937), No. 4, p. 6–8, 36–39, figs. 2*).—A control area (no treatment) being taken as 100 percent, the author found that liming alone raised the yield of clippings to 110.3, lime and superphosphate to 149.4, and lime, superphosphate, and potassium chloride to 179.4 percent. In these tests the rates of application per acre were ⅓ ton of hydrated lime, 600 lb. of superphosphate, and 100 lb. of potassium chloride applied in the early spring of 1929. "Using prices as of March 1936, the cost of these materials was $9.37, in contrast to the value of the extra feed produced by the complete treatment for the 3-yr. period, which would total $81.90 when purchased as concentrate feeds.

"The increase in total yield was only one phase of the improvement produced by mineral fertilizers. Of even greater importance was the beneficial change in the seasonal distribution of growth. The complete mineral fertilizer stimulated growth 2 weeks earlier than on untreated plats, and also continued feed production at a much higher level during the months of July and August when permanent pastures are usually short."

Learn your soil's limiting factors, F. S. Prince. (N. H. Expt. Sta.). (*Better Crops With Plant Food, 21 (1937), No. 4, pp. 19, 20, 39–41, figs. 3*).—This brief contribution deals mainly with possible deficiency of magnesium, as illustrated by the comparatively recent observation of magnesium deficiency as the cause of a chlorosis and lowered yield of potatoes in Maine, and of the other elements required in minute quantities. The deficiencies are attributed, in part at least, to the combined depletions effected by leaching, cropping, and erosion.

The use of soil tests in conservation, F. S. Prince. (N. H. Expt. Sta.). (*Better Crops With Plant Food, 21 (1937), No. 10, pp. 11–13, 42–44, figs. 3*).—By selecting methods for suitability to the soils of the State, the author finds it possible to base recommendations of liming and fertilizer treatment on rapid chemical soil tests with very generally satisfactory results.

Experimental work showed that liming to pH 6.0 is sufficient for alfalfa, in the presence of an adequate NPK supply, and that pH 5.6 is high enough for red

clover. Of 1,000 soil tests taken as an example, 415 showed a pH value of 5.5 or more and 137 a pH value of 6 or more.

Of the 1,000 samples, 399 showed some degree of need for magnesium, and a need for nitrogen was shown by tests for both ammonium nitrogen and nitrate nitrogen in somewhat more than half the samples. Phosphates and potassium were more general needs, however. The author finds that, "with clover as an example, 415 soils would produce good red clover without lime, about half or a little more of them would need a fertilizer carrying nitrogen or its equivalent in manure, but 935 of the soils tested would need phosphorus and 896 would certainly need potash fertilization, either from manure or from a potash fertilizer, and most of them from both."

Treatment with lime or with lime and superphosphate only as a general practice is to be avoided, in that a well-balanced fertilizer treatment will not only better conserve and build up the soil but "will mean more immediate returns in the way of better legumes and pasture crops. These two things in the long run will mean an earnest participation in the conservation program."

Fertilizer response on Colby silt loam, F. L. Musbach. (Wis. Expt. Sta.). (*Better Crops With Plant Food, 21 (1937), No. 8, pp. 6–8, 44, figs. 2*).—Treatments, yields, fertilizer costs, and profits are noted on a control plat and nine fertilizer plats of a silt loam soil having a surface soil content of from 35,000 to 40,000 lb. per acre of potassium and from 1,200 to 1,500 lb. per acre of phosphorus with a pH value of from 5.0 to 5.5. "While this piece of work has been carried on only a relatively short time, it confirms the findings on other work in that phosphorus alone is not a well-balanced fertilizer for this soil type. Under conditions such as prevail on this field, a need for potash is indicated, and quite likely the use of some nitrogen would represent a more nearly balanced mixture for the crops grown in this rotation."

The plant food value of nitrogen in filter cake, R. J. Borden (*Hawaii. Planters' Rec. [Hawaii. Sugar Planters' Sta.], 42 (1938), No. 2, pp. 111–118, figs. 5*).—The nitrogen content of the filter cake applied in these experiments had not become available after the added material had been 6 mo. in the soil. Even a second cropping of this soil failed to show the desired residual effect or to indicate further availability of the nitrogen supplied with the filter-cake applications which preceded the first crop.

Basicity of some phosphates as related to nitrification, G. S. Fraps and A. J. Sterges. (Tex. Expt. Sta.). (*Jour. Amer. Soc. Agron., 29 (1937), No. 8, pp. 613–621*).—In slightly acid soils which required additions of calcium carbonate in order to nitrify well, neither dicalcium phosphate in 32 soils nor rock phosphate in 20 soils had an appreciable effect on the nitrification of ammonium sulfate. Additions of magnesium carbonate and dolomite increased nitrification, but not as much as did the addition of calcium carbonate. In their effect upon nitrification, dicalcium phosphate and rock phosphate acted as if neutral, not basic. The effect of dicalcium phosphate on the acidity was not always the same. It decreased the acidity of some soils and either increased the acidity in others or had no appreciable effect.

The nature of potash fixation in soils, G. W. Volk. (Wis. Expt. Sta.). (*Soil Sci., 45 (1938), No. 4, pp. 263–276*).—Samples of untreated minerals did not, for the most part, fix appreciable amounts of potash, although one sample of muscovite fixed 1,700 p. p. m. of K_2O and bentonite fixed 8,850 p. p. m. Potash fixing capacities of muscovite and sericite were appreciably increased by treatment with carbonated water but were not significantly changed by treatment with sodium carbonate solution. Additions of colloidal silica and alumina did not change the amount of potash fixed by kaolinite but greatly increased the amount fixed by pyrophyllite. The grinding of kaolinite, sericite, and muscovite

for 4 days in a ball mill did not change the capacity of these materials to fix potash. Treatment of a soil and of decomposed granite with sodium carbonate solution increased the capacity of these materials to fix potash, and treatment of these materials and of a bentonite with weak hydrochloric acid decreased this capacity. As greater amounts of colloidal alumina were extracted, the capacity to fix potash decreased, and as decreasing amounts of colloidal silica along with a constant amount of colloidal alumina were removed, the capacity to fix potash decreased. The fixing capacity of soils and of decomposed granite which had been treated with dilute HCl increased when alumina or both alumina and silica were added but did not change appreciably when silica alone was added. Potash fixing capacities of decomposed granite and soils, excepting that of the Chico soil, were greatly reduced by leaching with 0.0001 N H_3PO_4 and by addition of monocalcium phosphate.

None of the pure minerals had a fixing power approaching that of clays, and the results "do not warrant ascribing the fixing power to any definite mineral. It is significant, however, that the removal of free alumina from clays decreased fixing power, and that on replacement of this alumina the fixing power is also restored."

When do our soils need potash? H. F. Murphy. (Okla. Expt. Sta.). (*Better Crops With Plant Food, 21 (1937), No. 10, pp. 22, 37*).—Using an ammonium acetate replacement method, the author found that soils yielding less than 60 p. p. m. of potassium showed a good response to treatment with potassium soils, from 60 to 100 some response, from 100 to 124 doubtful, from 125 to 199 usually no response, and over 200 p. p. m. no response. Soils on which these data were secured were used as standard soils for comparison work with some of the quick methods in the laboratory. Field data substantiated the results generally. The crops used in the field experiments and upon which crop response was determined were sweetclover, alfalfa, corn, cotton, and potatoes.

The preparation, composition, and chemical behavior of the complex silicates of magnesium, calcium, strontium, and barium, L. T. Kardos and J. S. Joffe. (N. J. Expt. Stas.). (*Soil Sci., 45 (1938), No. 4, pp. 293–307, figs. 3*).—This investigation indicates, in part, that the affinity of Mg^{++} ion is greater than that of Ca^{++} ion for the SiO_3^{--} ion; that the affinity of Mg for a highly multivalent silica sol which was used in the experiments reported can hardly be ascribed to the adsorbed OH^- and thereby to the formation of insoluble $Mg(OH)_2$ in the interface, since theoretical considerations (the Debye-Hückel and Onsager theories) have been shown to indicate that the colloidal silicic acid solutions belong to the class of strong acids and are stronger than truly soluble acids of similar basicity, from the standpoint of the number of electron charges with which each particle is combined; and that "the mutual electron affinities of Mg and O plus the ionization potentials, both of which contribute to the lattice energy and therefore to the rigidity of the bond between the associated atomic ions and the inner layer, indicate the Mg-O linkage to be stronger than the linkage of the alkaline earth cations with oxygen."

Availability studies on magnesium in magnesic limestones, serpentine, olivine, and magnesium ammonium phosphate, G. F. Lea and J. B. Smith. (R. I. Expt. Sta.). (*Amer. Potato Jour., 15 (1938), No. 1, pp. 4–9*).—The availability of the magnesium content of several magnesic limestones, serpentine, olivine, and ammonium magnesium phosphate was studied in pot cultures in which Irish Cobbler potatoes grown in a magnesium-deficient soil were used as the plant indicator. In a similar manner the effect on tuber yields of the addition of calcium carbonate, magnesium sulfate, and extra potash to this soil has been

determined. Potatoes were found very responsive to applications of magnesium in the forms of magnesium sulfate and other carriers. High available potassium contents accentuated magnesium deficiency. Tuber yields indicated a variation in the availability of MgO in the limestones used. The magnesium in the serpentine and olivine studied was shown to be in a form available to potato plants to approximately the same extent as in the poorer magnesic limestones. Magnesium ammonium phosphate supplied magnesium in a very readily available form.

The effect of magnesic versus calcic liming materials on calcium in vegetables, forage crops, and on certain soil properties, D. R. Willard and J. B. Smith (*Rhode Island Sta. Bul. 263 (1938), pp. 16*).—The conclusions here recorded are based upon 25 yr. of a field cropping experiment with magnesic and calcic limes applied in quantities having equal acid-neutralizing powers. Magnesic and calcic limestones and hydrated limes were used and their effects compared with check data from a plat treated with fertilizers but not limed.

The acidity of the plow slice, as shown by pH and by lime requirements, indicates the four forms of limestone to be approximately equal in effectiveness when applied on the basis of acid-neutralizing power. All of the liming materials have had a very decided effect in reducing the acidity of the 9–20-in. horizon, increasing the pH during the 25-yr. period from pH 4.98 for the unlimed and unfertilized plat to approximately pH 6.3 for the normal lime application and to near neutrality for the largest rate of liming. The two hydrates were similar in neutralizing action and slightly less effective in the subsoil than the limestones. Assuming that the calcium and magnesium in the soil of the fertilized but unlimed plat represents the residual effects of fertilization and cropping for the entire area, and subtracting these quantities from those found in the limed plats, a calcium retention in the topsoil equivalent to approximately 65 percent of that applied in liming is shown for the calcic hydrate and limestone. Corresponding values for magnesium retention from magnesic limestone and hydrate are 25 and 43 percent, respectively. "These values, however, must be viewed with caution for the crops removed from plat 82 [the check plat, fertilized but not limed] are less than those from the remainder of the area, and the errors of sampling and analysis can be large when calculated on the basis of acre weights of soil."

After 25 yr. of cropping and 9 yr. after the last previous lime application, spinach contained approximately two-thirds as much calcium after magnesic hydrate and magnesic limestone as after the corresponding calcic materials used on an equivalent acid-neutralizing basis. Significant reductions were not found for tomato fruits or potato tubers. Calcium reductions in grasses from 8 to 10 yr. after the last liming were approximately 15 percent and were quite similar for the mixed hays and for the components of the mixture, alfalfa, red clover, alsike clover, and timothy.

Copper—a trace element, R. V. Allison. (Fla. Expt. Sta.). (*Citrus Indus., 18 (1937), No. 12, pp. 14, 22*).—The author here briefly summarizes observations on the value of small quantities of copper compounds in plant nutrition, together with present recommended practice in the application of copper salts for the control of deficiency disease ("dieback") of citrus trees and as a part of the preliminary treatment in the reclamation of raw peat and muck soils.

Selenium occurrence in certain soils in the United States, with a discussion of related topics.—Third report, H. G. Byers, J. T. Miller, K. T. Williams, and H. W. Lakin (*U. S. Dept. Agr., Tech. Bul. 601 (1938), pp. 75, figs. 15*).—Continuing a series of reports previously noted (E. S. R., 76, p. 590), this bulletin describes methods of analysis shown to give satisfactory results in

the examination of seleniferous soils and minerals and the results of a reconnaissance survey of seleniferous areas in Kansas, eastern Colorado, New Mexico, Arizona, and Utah, a survey in eastern Colorado, and a survey in New Mexico. The bulletin takes up also soil profiles, the Greenhorn formation, the Morrison formation, the San Isabel National Forest, an old salt well, drainage waters of the Colorado River Basin, selenium and ocean water, selenium in German waters, selenium in Hawaii, selenium in Puerto Rico, forms of selenium in the soil, origin of selenium in soils, plant associations on seleniferous soils, and miscellaneous data.

"The distribution of selenium in soils appears to be general. No true soils containing colloids in any significant quantity have been found in which the presence of selenium cannot be demonstrated. The amounts found range from fractional parts per million to quantities which exceed 80 p. p. m. The source of the selenium is believed to be the residual selenium derived from the soil parent material, supplemented by that derived by direct absorption from the air by rain. The presence of selenium in normal air has not yet been demonstrated, but its presence in volcanic emanations has been shown. It has been shown that absorption of selenium by soils from precipitation is the chief apparent source of selenium in certain soils (Hawaiian). It has been demonstrated that selenium may exist in soils as the element; as a substituent in sulfide minerals, particularly pyrites; as selenite, particularly basic ferric selenite; as selenate, particularly as calcium selenate; and as organic selenium compounds of undemonstrated composition. Of these forms apparently those most available to the soil solution are the organic and selenate forms.

"It seems very probable that the concentration of selenium in sedimentary geological formations is due to absorption of volcanic selenium and its deposition along with the other shale materials. When, due to the subsequent geologic changes, these shales become parent material for soils, the selenium remains in the soil partly in 'available' and partly in 'unavailable' forms in semihumid *or arid areas. In humid areas the leaching of the soils removes available* selenium. Whether these assumptions are correct in detail or not, it remains true that up to the present the soils so far found to contain considerable quantities of selenium are those derived from the shales and limestones of the Cretaceous period."

Effect of different soil colloids and whole soils on the toxicity of sodium selenate to millet, P. L. Gile, H. W. Lakin, and H. G. Byers. (U. S. D. A.). (*Jour. Agr. Res.* [*U. S.*], *57* (*1938*), *No. 1, pp. 1–20, figs. 2*).—The authors determine, in sand, in soil, and in sand-soil mixtures, the quantities of sodium selenate capable of reducing yields of the test plant to one-half normal.

They conclude that the toxicity of sodium selenate is not appreciably affected by phosphate fertilization but is affected by the vertical distribution of selenate in the pot and by sulfate fertilization. When the sulfate application is high, the selenate application needed to reduce yield one-half may be from two to three times that needed when the sulfate supply is adequate only for maximum yield.

With a constant sulfate fertilization, sodium selenate is as toxic in sand-soil mixtures containing 1 percent of different soil colloids as in pure quartz sand but is somewhat less toxic in whole soils. "It does not seem that the small reduction in selenate toxicity in whole soils, as compared with quartz sand, is due to a specific reaction between colloid and selenate, resulting in a compound unavailable to the plant. The reduction in toxicity seems rather to be due to a general effect of the colloids, possibly on movement of selenate in the soil medium." Differences between the toxicities of selenate in sand and in 14 soils bear no relation to the silica: sesquioxide ratios of the soil colloids.

Marquis wheat grown for 48 days requires one and one-half times as much selenate to reduce yield one-half as millet grown to the jointing stage, and at the half-yield degree of injury the part above ground contains about twice as much selenium.

Data obtained in 1-gal. pots indicate that about 1.5 p. p. m. of selenium as selenate, or 3 lb. per acre 6 in., should be distinctly injurious to millet in most soils. "This calculation from a pot to an acre is of course not reliable, but the figure is in harmony with field observations."

It is noted that these conclusions apply only to sodium selenate, and that quite different results are being obtained with sodium selenite.

AGRICULTURAL BOTANY

Plant research results for 1937, K. Post. (Cornell Univ.). (*Florists Exch. and Hort. Trade World, 90 (1938), Nos. 15, pp. 21, 22; 16, pp. 14, 15, 16*).—This contribution summarizes work on plant propagation, on shade trees, lawns, ornamental plants, plant breeding, water culture, diseases, and various physiological problems.

[Agricultural botany studies in Ohio] (*Ohio Sta. Bul. 592 (1938), pp. 38, 39, 40*).—Brief notes are given on the effect of growth substances on tree roots, by P. E. Tilford; and the significance of bacteriophage in alfalfa culture, and the bacteriophage as an aid in identifying and isolating bacteria, both by R. C. Thomas.

Plant production [trans. title] (*Jahresber. Agr. Chem., 4. ser., 16 (1933), pp. 1–124*).—Among other subjects, abstracts and bibliographies are included relating to the sources of plant nutrition (atmosphere, water, soils, and fertilizers) and to plant growth (physiology, plant constituents, and crop culture).

Life-span of seeds, W. Crocker (*Bot. Rev., 4 (1938), No. 5, pp. 235–274*).—This analytical review (with 71 literature references) considers storage conditions in relation to life span in seeds of short life span, seeds of water plants, and seeds of land plants that endure considerable drying: records of life span of macrobiotic seeds; life span of seeds in soil and under water; and the life span of coniferous and farm and garden seeds.

Structure of the starch granule, C. L. Alsberg (*Plant Physiol., 13 (1938), No. 2, pp. 295–330*).—The author presents a hypothesis regarding the anatomical structure of natural starch granules, with supporting evidence in the way of a critical review of the literature (with 112 references).

Plant diastase in evidence as to the formation and structure of starch granules, G. L. Teller (*Plant Physiol., 13 (1938), No. 2, pp. 227–240, figs. 7*).—"Vegetative diastase," predominating in wheat bran and widely distributed, is most abundant where active vegetation is occurring, and closely associated with it is the form with preponderantly liquefying properties. "Reserve diastase," predominating in flour and limited in distribution, is present in certain substances containing much reserve starch.

By careful study of young growing potatoes, starch granules may be seen in various developmental stages. There is at first a thin, amorphous haze, blued by very dilute iodine, followed by successive stages of denser aggregations. Around each a coating forms, binding the interior into a completed granule and protecting it against solution. Granules are often enlarged by surface deposits of starch substance over which the coating is extended. Evidence of similar starch formation is seen in developing wheat grains, etc. The granule interior is at first amorphous, while later, and apparently only underneath the coating, it becomes organized into series of segments. When the

coating is removed carefully, as by liquefying diastase, groups of these segments, and eventually many of them, are gradually released, appearing as various regular forms. Acted on further by diastase, they diminish in size, then pass wholly into solution, and soluble starch, dextrin, and/or sugar are found in their stead.

Influence of certain environmental conditions on congestion of starch in tomato plant stems, A. C. Foster and E. C. Tatman. (U. S. D. A.). (*Jour. Agr. Res. [U. S.], 56 (1938), No. 12, pp. 869–881, figs. 7*).—Data collected under greenhouse conditions showed the influence of varying the fertilizer formula, soil moisture, temperature, humidity, and evaporation capacity of the air on starch accumulation in tomato-plant stems, on the water requirement or transpiration ratio, on the dry weight of the plants, and on fruit yields. The highest accumulation occurred in the unfertilized treatments. However, soil moisture and temperature greatly influenced the starch content of the stems, with the largest amount appearing in plants grown in soils at 72 percent of the water-retaining capacity. Plants grown at 65° F. had a much higher starch content than those grown at 74°.

Effect of certain ions, used singly and in combination, on the growth and potassium, calcium, and magnesium absorption of the bean plant, R. L. Carolus. (Va. Truck Expt. Sta.). (*Plant Physiol., 13 (1938), No. 2, pp. 349–363, figs. 2*).—On account of the present trend in the fertilizer industry toward *the elimination of Na, Cl, and S, a reduction in the amount of Ca, and the* inclusion of Mg in increasing amounts, a study of the effects of these elements on growth, cation absorption, and utilization in bean plants was undertaken. From this work, details of the methods and results of which are given, it is concluded that if plants with poor growth have a higher content of a given nutrient (determined by p. p. m. in the stem sap) than similar plants with superior growth, something is interfering with the proper utilization of that nutrient after its absorption. This situation was found in the K series of tests reported. However, if the sap of plants with superior growth has a higher content of a given nutrient than that of plants with poor growth, the cause is probably a lack of the ability to absorb this nutrient in the case of stunted plants. This occurred in the Mg series. Failure to absorb may be due to a deficiency of the nutrient in available form, or to some absorption phenomenon such as lack of antagonism. The results presented should not be construed as applying to all plants, as preliminary work has indicated that other plants do not respond in a manner similar to that here reported for beans.

Nutrition studies with corn.—II, A statistical interpretation of the relation between the ionic concentration of the culture solutions and the element content of the tissues, J. R. Beckenbach, W. R. Robbins, and J. W. Shive. (N. J. Expt. Stas.). (*Soil Sci., 45 (1938), No. 5, pp. 403–426, figs. 6*).—Continuing these studies (E. S. R., 76, p. 456), plants were grown in sand cultures with a series of nutrient solutions differing in proportions of the essential ions, K, Ca, Mg, phosphate, nitrate, and sulfate. For each treatment, leaf and stem tissues were harvested separately, and each fraction was analyzed for soluble and total content in K, Ca, Mg, P, N, and S. The most important single condition concerned in the penetration and accumulation in the tissues of each of the elements investigated proved to be its absolute concentration in the nutrient solution. It was further found that the tissue content of any element may be directly or inversely related to the concentration of other elements in the substrate, depending on certain of their known chemical properties and the nature and degree of their physiological importance. The general trends of these relations in stem v. leaf tissues were very similar, although the order of

magnitude of values differed considerably. Some of the more important specific relations indicated by means of the statistical treatment of the data, and within the range of ion concentrations employed, are summarized.

Microelements in culture-solution experiments with higher plants, D. I. Arnon. (Univ. Calif.). (*Amer. Jour. Bot., 25 (1938), No. 5, pp. 322–325, fig. 1*).—In lettuce and asparagus grown in water culture solutions supplemented by minute amounts of different groups of elements, a marked beneficial response followed the joint addition of B, Mn, Zn, and Cu. A further significant increase in the growth of these plants was obtained by adding a group of seven elements (Mo, V, Ti, W, Cr, Ni, and Co)—suggesting that one or more of these elements plays a role in higher plant nutrition.

Accessory salts in the nutrition of excised tomato roots, P. R. White (*Plant Physiol., 13 (1938), No. 2, pp. 391–398, figs. 4*).—Of the 12 accessory salts in the Trelease and Trelease formula (E. S. R., 70, p. 311) only four ($MnSO_4$, $ZnSO_4$, H_3BO_3, and KI) appeared to be essential for growth of isolated tomato roots under the experimental conditions. Other salts may have been introduced as impurities, but played no recognizable role in root growth. When the four salts named were added to a nutrient containing the standard salts of Pfeffer's solution, iron, sucrose, amino acids, and vitamin B_1, in proper proportions, the resulting nutrient proved to be almost, if not quite, equal to a yeast extract medium as a source of materials essential to growth of these roots.

Selenium as a stimulating and possibly essential element for indicator plants, S. F. and H. M. Trelease (*Amer. Jour. Bot., 25 (1938), No. 5, pp. 372–380, figs. 3*).—Selenite at 1–27 p. p. m. had a pronounced stimulating effect on the growth of *Astragalus racemosus* and *A. pattersonii* in solution and sand cultures. These tests, supplemented by field observations on the distribution of the plants, suggested that selenium may be an essential microtrophic element for these and other indicator plants, including several species of *Astragalus*, *Xylorhiza*, *Oonopsis*, etc. *A. racemosus* tolerated about 10 times the concentration of selenite that could be withstood by wheat and buckwheat. Sulfur as sulfate tended to reduce the toxicity to the plants of the lower Se concentrations. Accumulation of Se by this species was directly related to its concentration and inversely so to that of S in the culture solution. Excess S, though reducing the Se content to ⅓–⅔ of the amount present without S, failed to prevent these native range plants from accumulating sufficient Se (177–2,098 p. p. m.) to render them potentially lethal to animals. These data are considered applicable only to the particular compound (selenite) used in the culture solution.

Absorption of selenium by tobacco and soy beans in sand culture, A. L. Martin and S. F. Trelease (*Amer. Jour. Bot., 25 (1938), No. 5, pp. 380–385, figs. 5*).—Tobacco was more severely injured than soybeans by sodium selenite supplied through a continuously renewed nutrient solution to sand-cultured plants. Stunting was the only symptom uniformly developed by tobacco, while soybeans exhibited root lesions and stem intumescences in addition to the usual stunting and chlorosis. The presence of sulfate in the lower selenite concentrations tended to decrease the toxic effects of the latter, but the antagonism was never sufficient to allow growth equaling the controls. The amount of Se absorbed was directly related to the selenite concentration of the nutrient solution, while addition of sulfate to the solution tended to reduce its accumulation in the plant. The greatest decrease in Se content, however, was to one-half or one-third the amount present in the absence of sulfate. With the concentrations of selenite used, this reduction was insufficient to render the plants incapable of possible injury to animals.

Effect of low concentrations of sulphur dioxide on yield of alfalfa and Cruciferae, C. Setterstrom, P. W. Zimmerman, and W. Crocker (*Contrib. Boyce Thompson Inst., 9 (1938), No. 3, pp. 179–198*).—Under none of the conditions studied did the low concentrations (not causing visible leaf injuries) of SO_2 used cause decreases in the alfalfa yields, under most of the conditions they had no significant effect on yields, and under some of the conditions they induced significant yield increases. The data obtained are taken to indicate that sulfur deficiencies in the nutrient supply were made up by absorption of SO_2 from the air. The age of the plants and the amounts of supplied nutrients had no effect on the yield responses to the gas treatment, but alfalfa grown under a deficient water supply seemed to respond more readily to the stimulating effect of SO_2 than that with an ample water supply. Rapidly growing alfalfa under favorable light conditions also responded more readily than slow-growing plants under less favorable light conditions. Analyses of the sulfur content of the alfalfa indicated that the SO_2 treatment had brought about significant increases in total sulfur. The only other variant affecting the sulfur content was the sulfur in the nutrient supply. Analyses of alfalfa showed that no significant effects on its nitrogen content had been induced by SO_2, the water supply, or the sulfur content of the nutrient supply. The SO_2 treatment had no significant effect on yields of the Cruciferae used (rutabaga, cabbage, turnip, and mustard).

Ammonium nutrition and metabolism of etiolated seedlings, L. Burkhart (*Plant Physiol., 13 (1938), No. 2, pp. 265–293, figs. 11*).—Adapting improved methods, this study involved a further investigation of the effects of ammonium nutrition on the carbohydrate and nitrogen relations of etiolated seedlings of pumpkin, peanut, and white and yellow lupines, fractioned into stems, cotyledons, and roots for analyses. The conditions here resulting during ammonium nutrition could not be ascribed to physiological acidity. The absorption and utilization rates of ammonium were most rapid in pumpkins. Although the food reserves of the peanut kernel were somewhat similar to those of pumpkins, its seedling response to ammonium was very sluggish. Ammonium was utilized especially by the roots of white lupine until the twelfth day. The yellow lupine seedlings utilized it in the early stages (3 and 6 days). Detailed results with these four plants are given. All the seedlings used absorbed and utilized ammonium during the early germination stages, while the synthetic processes were disrupted during the carbohydrate starvation period when ammonium accumulated as a result of the breakdown of organic nitrogen from the exhaustion of available carbohydrates. Ammonium injury was apparently associated with carbohydrate depletion, but is not ascribed to any specific condition.

It appears to have been demonstrated that at least three distinct internal conditions (with intergradations) are associated with the responses of etiolated seedlings to ammonium nutrition: (1) In the early growth stages, with abundant carbohydrates, ammonium is readily absorbed and utilized, resulting in protein synthesis which is especially evident in the roots, and it tends to favor the growth of the seedlings, varying with the species, (2) in intermediate stages, with carbohydrates less plentiful, though ammonium is still absorbed and utilized, proteins are broken down and amides accumulate; ammonium now has little effect on growth, and (3) when carbohydrates have become seriously depleted, is neither utilized nor absorbed. Proteins continue to be broken down, amides are decomposed, ammonium accumulates, and there may or may not be an increase in amino nitrogen. Leaching of nitrogen from the seedlings now tends to occur. Carbohydrate starvation becomes progres-

sively evident as characterized by growth cessation followed by drying of aerial organs. The ammonium accumulation is now due to the breakdown of organic nitrogen compounds resulting from the extreme deficiency of available carbohydrates.

A review of the literature, with 64 references, is included.

Formation of nitrate in detached green leaves of Swiss chard and tomato, M. C. McKee and D. E. Lobb (*Plant Physiol., 13 (1938), No. 2, pp. 407–412, figs. 2*).—These leaves, subjected to air drying at room temperature in a well-ventilated place, showed for a limited time an increase in nitrate content, this change being more pronounced in tomato and varying in two lots of leaves from the same seed but grown under different conditions. The leaves of both species, cultured in distilled water in the absence of light, gave evidence of slight nitrate formation, again the increase in nitrate varying with the nature and condition of the leaf.

The effect of sodium chloride on the Eh of protogenous media, L. E. Stuart and L. H. James (*Jour. Bact., 35 (1938), No. 4, pp. 369–380, figs. 6*).—The oxidation-reduction potential of protogenous media was found to decrease with increases in both initial pH and the amount of NaCl added prior to sterilization. NaCl added to the poise. Protogenous media containing high concentrations of NaCl may be materially oxidized during sterilization. Deviations from the specific results reported would be expected with different lots of peptone and gelatin, but it is believed that they would not be great enough to alter the basic effects found in this study.

The serology of spores of Bacillus niger with special reference to the H antigen, E. J. Krauskopf and E. McCoy. (Univ. Wis.). (*Jour. Infect. Diseases, 61 (1937), No. 2, pp. 251–256, figs. 2*).—As reported in this contribution, cross agglutinations indicated a close serological relationship between the spores and vegetative cells, and absorption tests revealed the presence of an H (flagellar) factor in the spores, demonstrable by both in vivo and in vitro reactions. The effects of alkali treatment are also noted.

Further studies on artificial parthenocarpy, F. G. Gustafson (*Amer. Jour. Bot., 25 (1938), No. 4, pp. 237–244, figs. 7*).—Of the 13 new chemicals tested, K-indole acetate and pyrrole-α-carbyxylic and pyrrole-α-acetic acids induced the development of parthenocarpic fruits in several plant species. The potassium salt of indoleacetic acid proved about as effective as the acid. The fact that the pyrrole compounds are active is taken to indicate that the indole radicle is unnecessary for the growth-promoting activity of the indole compounds. Even with the apical part cut off, the basal part of a crookneck summer squash, without ovules, will grow if supplied with growth-promoting substances, but the presence of ovules seems to give a somewhat better growth. The ovaries of this squash in which seeds have started to grow will not continue growth if cut in such a manner as to eliminate all the developing seeds.

It seems evident that the ovules growing into the seeds normally supply the growth hormone causing the ovary to become the fruit, but if this is true the question remains open as to where the hormone originates that is instrumental in the growth of spontaneous parthenocarpic fruits like seedless oranges, grapefruits, grapes, bananas, cucumbers, etc.

Growth substances and controls, H. T. Skinner. (Cornell Univ.). (*Florists Exch. and Hort. Trade World, 90 (1938), No. 18, p. 8*).—This note calls attention to certain oversights often appearing in the presentation of experimental data, particularly in the failure to include the final as well as the initial counts of rootings on treated v. control cuttings. "The initial count is only an indication of speed of rooting—which may or may not be important."

Preliminary experiments on the relation of growth-promoting substances to the rest period in fruit trees, J. P. BENNETT and F. SKOOG. (Calif. Expt. Sta.). (*Plant Physiol., 13 (1938), No. 2, pp. 219–225, fig. 1*).—These studies are believed to demonstrate that low temperature (cold storage or field) is essential for normal breaking of the rest period. After exposure to low temperatures a precursor of auxin accumulates in the buds, followed by the gradual appearance of auxin, which is correlated with the end of the rest period.

Effect of ethylene thiocyanohydrin, ethyl carbylamine, and indoleacetic acid on the sprouting of potato tubers, J. D. GUTHRIE (*Contrib. Boyce Thompson Inst., 9 (1938), No. 3, pp. 265–272, figs. 2*).—A substance believed to be ethylene thiocyanohydrin proved effective in breaking the dormancy of potato tubers, while ethyl carbylamine also showed a marked activity in this respect. Neutralized indoleacetic acid inhibited the sprouting of pieces of nondormant tubers when their bases were soaked in solutions containing 25–100 mg per 100 cc for 1–7 days at 10° C., but such treatment induced rooting at the cut surfaces. "Rooting at this part of potato tubers has not been observed before in this laboratory, nor have we found a report of such rooting in the literature."

Cultivation of excised roots of dicotyledonous plants, P. R. WHITE (*Amer. Jour. Bot., 25 (1938), No. 5, pp. 348–356, figs. 21*).—Attempts to grow isolated roots of dicotyledonous plants in vitro were successful for 18 of 30 species, while 12 proved refractory to the treatments used. Although roots of all dicotyledonous species can probably be grown under proper conditions, it appears that in many cases these conditions will differ widely. Probably no generalizations can be drawn as to the requirements of isolated roots which will apply satisfactorily to all species.

Effect of fungi on the oxidation-reduction potentials of liquid culture media, D. F. MCALISTER (*Amer. Jour. Bot., 25 (1938), No. 4, pp. 286–295, figs. 10*).—The data presented indicate that the fungi used had a definite effect on the oxidation-reduction potentials (Eh) of the media in which they were grown, they being lowered in all cases during the initial period of vegetative growth. *Aspergillus niger* proved to be the most uniform with regard to the intensity of its reduction of the Eh of the media, the minimum level established always being ±0.2 v. *Penicillium granulatum* cultures in most cases produced the greatest reduction of Eh levels. Data are also given for *Sclerotinia fructicola, Botrytis allii*, and *Penicillium expansum*. A difference in Eh of 0.2 v in the media appeared to have no effect on the ability of these fungi to initiate growth, nor did spore production appear to be related to the Eh level of the media. In sterile media, the Eh/pH relationship varied from 55 to 38 mv change in Eh for each pH unit from 2.5 to 6.0. The Eh changes produced by the fungi in the media appeared to have no direct relationship with pH changes.

Protoplasmic streaming, electric potentials, and growth in coleoptiles of Triticum and Avena, H. G. DU BUY and R. A. OLSON. (Univ. Md.). (*Science, 87 (1938), No. 2265, pp. 490, 491*).—The tests reported indicate that changes in bioelectric potentials, due to modifications in external conditions, change the protoplasmic streaming, hence the auxin transport, and finally the growth.

The role of salts, hydrogen-ion concentration, and agar in the response of the Avena coleoptile to auxins, K. V. THIMANN and C. L. SCHNEIDER (*Amer. Jour. Bot., 25 (1938), No. 4, pp. 270–280, figs. 8*).—When blocks of plain agar were soaked in simple solutions of indole-3-acetic or indole-3-butyric acids, the auxin concentration in the agar failed to reach that in the aqueous phase. Addition of KCl (and to a lesser extent of other salts, or even tap water) increased the auxin concentration in the agar. The sensitivity of the *Avena* curvature test was greatly increased by lowering the agar concentration. The type of relation-

ship between auxin concentration and curvature also depended on the agar concentration, and it was thus deduced that the straight line relationship obtained under certain conditions is only of empirical interest. In the *Avena* curvature test the activity of the two acid growth substances used was not lower than that of the potassium salts. In the straight growth of immersed coleoptile sections, the two acids were more toxic at extremely high concentrations than were their salts, and this was apparently associated with their more rapid entry into the cell. In the straight line growth of immersed coleoptile sections, neutral salts proved to be an especially important factor, especially in the presence of auxin. Their action was not nutritive, but was thought to be due either to their entry and subsequent contribution to the osmotic pressure or to their action on the colloid properties of the tissues. In the chlorides, the order of their effectiveness was Ca<Li$\gtreqless$Rb<Na$\gtreqless$K. It is emphasized that this effect is clearly distinguishable from the effect of neutral salts on the auxin-agar relationship. The growth of immersed coleoptile sections was directly proportional to the osmotic gradient between their contents and the surrounding solution. Sections cut from coleoptiles grown in darkness elongated more in auxin solutions than those grown under red or white light.

Absorption and translocation of auxin, F. SKOOG. (Univ. Calif.). (*Amer. Jour. Bot., 25 (1938), No. 5, pp. 361–372, figs. 8*).—In this study, auxin produced in tomato and squash plants was transported polarly basipetally through the stems in both intact plants and cut sections, and this might occur in parenchymatous and vascular tissues but not normally in the xylem. The 3-indoleacetic acid supplied in external solutions under appropriate conditions was rapidly absorbed through intact roots and translocated into the stem, this upward movement occurring with the transpiration stream through the xylem. Auxin so introduced moved laterally from the xylem into surrounding stem and leaf tissues, and was then reexported by the normal polar transport. Various factors (e. g., transpiration rate, pH, and salt concentration) influence the auxin uptake from external solutions. Under given conditions and over a considerable concentration range, its uptake is proportional to the concentration supplied. With rapid transpiration the upward rate may be several times that of the downward movement, the relative rates of the two movements determining the minimum concentration necessary for uptake into the stem. Under the greenhouse conditions used, no absorption of auxin into the stems occurred from concentrations lower than 0.05 mg per liter. It is concluded that auxin supplied in external solutions may influence the growth of aerial plant parts in two ways: High concentrations may be absorbed and act directly on these tissues, while very low concentrations (± 0.00005 mg per liter) are not absorbed into the aerial parts but may act directly through an influence on the roots.

The effect of colchicine on somatic cells of Tradescantia paludosa, R. I WALKER. (Univ. Wis.). (*Jour. Arnold Arboretum, 19 (1938), No. 2, pp. 158–162, pls. 2*).—All treatments tried in this study indicated that colchicine affects the cytoplasm, supressing spindle fiber formation and normal cellular differentiation and causing development in changed proportions of all structures of the flower.

Evidence that plant tissue forms a chlorine-containing β-glucoside from ethylene chlorohydrin, L. P. MILLER (*Contrib. Boyce Thompson Inst., 9 (1938), No. 3, pp. 213–221*).—The nonvolatile organic chlorine compound formed by potato and gladiolus tissues from absorbed ethylene chlorohydrin was found to be hydrolyzed by emulsin with the formation of a volatile organic chlorine compound and reducing sugar, or at least a substance or substances reducing

Fehling's solution. Preliminary tests on the effect of emulsin hydrolysis on the optical activity (gladiolus material) indicated that the shift is towards the right. The results are believed to offer strong evidence that the compound formed from the absorbed chlorohydrin is a β-glucoside, and that glucoside formation can be utilized by the plant to render an introduced chemical less active.

The utilization of sulphate in the synthesis of glutathione by potato tubers following treatment with ethylene chlorohydrin, J. D. GUTHRIE (*Contrib. Boyce Thompson Inst., 9 (1938), No. 3, pp. 233–238, figs. 1*).—Sulfate sulfur was shown to be utilized by potato tissue in the synthesis of glutathione following treatment of the tubers with ethylene chlorohydrin. A quantitative investigation of the process indicated that part of the sulfate sulfur enters a compound other than glutathione.

Extensibility of cell wall material in indole-3-acetic acid, W. S. STEWART (*Amer. Jour. Bot., 25 (1938), No. 5, pp. 325–328*).—In repeating the experiments of Robbins and Jackson (E. S. R., 78, p. 172) on the extensibility of stem and root walls, no conclusive evidence was found as to the effect of growth hormone on them. Artificial silk had an increased extensibility in certain organic acids known not to be growth substances, as well as in 0.2 percent indoleacetic acid. Onion roots had an increased extensibility in 0.2 percent indoleacetic acid and in 0.2 percent acetic acid.

The specificity of pyrimidine for Phycomyces blakesleeanus, W. J. ROBBINS and F. KAVANAGH (*Natl. Acad. Sci. Proc., 24 (1938), No. 3, pp. 141–145*).—Detailed data are given on the relation between the structure of pyrimidine compounds and their effectiveness when used with the vitamin thiazole on the growth of *Phycomyces*, the conclusion being that the pyrimidine part of the vitamin B_1 molecule is highly specific for the fungus.

The specificity of thiazole for Phycomyces blakesleeanus, W. J. ROBBINS and F. KAVANAGH (*Natl. Acad. Sci. Proc., 24 (1938), No. 3, pp. 145–147*).—Detailed data are given on the relation between the structure of thiazole compounds and their effectiveness on this fungus when used with a suitable pyrimidine compound, it being concluded that the thiazole portion of the vitamin B_1 molecule is highly specific for this fungus.

Thiamin and growth of species of Phytophthora, W. J. ROBBINS (*Bul. Torrey Bot. Club, 65 (1938), No. 5, pp. 267–276, figs. 2*).—The following species appeared to require for their growth an external supply of thiamine and were unable to utilize its intermediates: *P. boehmeriae*, *P. cactorum*, *P. cambivora*, *P. capsici*, *P. cinnamomi*, *P. citrophthora*, *P. cryptogea*, *P. dreschsleri*, *P. palmivora*, and *P. parasitica*. A medium consisting of mineral salts, asparagine, sugar, and thiamine proved much more favorable than one lacking asparagine. *P. fagopyri* differed from other species studied by growing in a medium supplemented with thiamine or its intermediate pyrimidine. A scheme is suggested for determining thiamine or its intermediates by using suitable fungi.

Thiamin and growth of Pythium butleri, W. J. ROBBINS and F. KAVANAGH (*Science, 87 (1938), No. 2263, p. 429*).—Confirmation is given of the importance of thiamine as a growth substance for plants, and it is further shown that the amount formed may be a limiting factor in the growth of an organism.

Evidence for a second thiamin, W. J. ROBBINS and F. KAVANAGH (*Natl. Acad. Sci. Proc., 24 (1938), No. 6, pp. 229, 230*).—Continuing the above studies this note presents data suggesting more than one compound capable of functioning in the living organism as does thiamine, viz, a methyl thiamine (the one originally isolated and synthesized), and an ethyl form differing in having the CH_3 group in the second position on the pyrimidine ring replaced by the C_2H_5 radical. Still other thiamines are postulated.

A chemical and physiological study of traumatin, a plant wound hormone, J. BONNER and J. ENGLISH, JR. (*Plant Physiol., 13 (1938), No. 2, pp. 331–348, figs. 3*).—After reviewing briefly the origin and development of the wound hormone concept, the authors describe a quantitative assay of wound hormone activity in immature bean pods in which the size of the new growth rather than the frequency of cell division is measured. The test was shown to be specific for wound hormone. By this quantitative assay it was possible to isolate a substance, apparently not far from pure and possessing typical wound hormone activity, for which the name "traumatin" is proposed.

The effect of spectral regions on the chlorophyll "a" to "b" ratio, W. E. TOTTINGHAM and H. J. DUTTON. (Univ. Wis.). (*Science, 87 (1938), No. 2253, p. 214*).—A brief discussion.

Formation of carotenoids and chlorophylls in etiolated barley seedlings exposed to red light, H. H. STRAIN (*Plant Physiol., 13 (1938), No. 2, pp. 413–418, fig. 1*).—Exposed to red light, both carotene and the chlorophylls increased rapidly in etiolated barley seedlings, while the xanthophylls increased more slowly. Impregnated with sucrose and kept in the dark, the presence of sucrose failed to promote carotene or chlorophyll formation in etiolated seedlings. Determination of the absorption spectra of lutein acetate and of β-carotene demonstrated that these substances, the principal constituents of leaf carotenoids, absorb considerable light in the red region in which chlorophyll exhibits its maximum absorption. Since etiolated barley seedlings contain extremely little green pigment, the red light absorbed by the yellow pigments must represent a large proportion of that absorbed by all the pigments present. Whether carotene formation in red light depends on the absorption of light by the yellow pigments or on other factors remains to be determined.

Some absorption spectra of leaf extracts, G. MACKINNEY. (Univ. Calif.). (*Plant Physiol., 13 (1938), No. 1, pp. 123–140, figs. 4*).

The double freezing point of living tissues, B. J. LUYET and P. M. GEHENIO (*Biodynamica, No. 30 (1937), pp. 23, figs. 14*).—The literature on the double freezing point of plant tissues is reviewed, and the curves obtained by various investigators are compared. This is followed by data from the authors' experiments with cylindrical pieces of potato tissue, in which the double freezing point was obtained only with living tissue. Temperatures immediately below the first freezing point failed to kill the tissue, and other characteristic differences between the curves of living v. dead tissue were observed. Soaking usually induced the double freezing point, while drying always suppressed it, but the length of the first freezing plateau did not increase in proportion to the amount of water imbibed. The first freezing point was raised by soaking, and it was not lowered by an increasing velocity of cooling except for extremes. The second freezing plateau was considerably influenced by varying the speed of cooling. In general, the double freezing point and other features of the freezing curves of living tissues are explained by assuming that water occurs in living matter (1) as intercellular solvent water, freezing readily, (2) as intracellular solvent water, freezing after exosmosis, (3) as a protoplasmic constituent, freezing after its separation from the protoplasm and exosmosis, and (4) as bound water, not freezing at all. In living tissues, the shape of each portion of the curve appears to depend on equilibrium between the velocity of cooling and that of extraction and of exosmosis of water. Four theories on the double freezing are discussed. That it represents the congelation of the intercellular fluids is believed to fit best with the observed facts.

Orientation in young cotton fibers as indicated by X-ray diffraction studies, W. A. SISSON (*Contrib. Boyce Thompson Inst., 9 (1938), No. 3, pp. 239–248, figs. 3*).—In the examination of cotton fibers of three varieties at various

growth stages by X-ray diffraction methods, it was found that at each age the X-ray diagrams showed a considerable variation in orientation. In general, however, fibers younger than 25 days gave the pattern of randomly oriented cellulose, while those ±25–35 days old had developed a preferred orientation which did not change appreciably with further wall thickening. The type of orientation always consisted of a preferred orientation with reference to the fiber axis. There was no evidence of selective orientation with reference to the cell-wall surface. The pattern of waxy materials, superimposed on that of cellulose in fibers younger than ±35 days, showed a preferred orientation in some of the samples. Drying under tension improved the orientaton of fibers with a preferred orientation, while those with a random pattern were not appreciably affected. Films and fibers prepared under tension from purified cellulose always showed a preferred orientation, regardless of the age of the fibers furnishing the cellulose. In the mature fibers, the degree of orientation varied in the order Pima>Super Seven>Acala. The possible relationship of this to physical properties and fiber abnormalities is pointed out.

Plant ecology, J. E. Weaver and F. E. Clements (*New York and London: McGraw-Hill Book Co., 1938, 2. ed., pp. XXII+601, [pl. 1], figs. 271*).—The purpose of this revision and enlargement of the work previously noted (E. S. R., 64, p. 526) is to furnish a comprehensive textbook in accord with present-day ecological progress and a guide to workers in the numerous related fields.

A bibliography of eastern Asiatic botany, E. D. Merrill and E. H. Walker (*Jamaica Plain, Mass.: Arnold Arboretum, 1938, pp. XLII+719, [figs. 2]*).—In making up this annotated bibliography, current literature was examined through 1936, except that continued papers appearing in 1937 were added. The scope of the project was widened to include the literature on all groups of plants for all of eastern Asia except northeastern Siberia, the area covered comprising China, Japan, Taiwan (Formosa), Chosen (Korea), Manchuria, Mongolia, Tibet, and eastern and southern Siberia. The major published papers appertaining to adjacent areas, such as the Philippines, Indochina, Siam, Burma, India, and central and northern Asia, are also included because of their importance in studying the plants of eastern Asia, and because through them the subsidiary literature on these areas can be reached. The objective has been to record those papers to which botanists concerned with studying the plants of this area must or should refer.

The first 500 pages of the text presents the annotated titles under their authors alphabetically arranged. Appendixes concern the older Oriental authors and reference lists of Oriental serials and of Oriental authors. The subject indexes include general, regional, and systematic indexes, a family index of generic names of vascular cryptogams and seed plants, and an index of the principal geographic names.

The ferns and flowering plants of central Pennsylvania, J. P. Kelly (*State College: Pa. State Col., [1937], pp. 120, [figs. 7]*).—Keys to the vascular flora of Pennsylvania are contributed.

The central bureau for fungus cultures, Baarn (Netherlands): List of cultures, 1937, J. Westerdijk (*Centraalbureau voor Schimmelcultures, Baarn (Holland): List of cultures, 1937. Amsterdam: K. Akad. Wetensch., 1937, pp. 124*).—The fungus cultures available for sale are listed alphabetically by Latin names with the names of the individuals from whom received.

Competition among fungi, C. L. Porter and J. C. Carter (*Bot. Rev., 4 (1938), No. 4, pp. 165–182*).—This critical review (with 181 literature references), covering published works of the nineteenth and twentieth centuries, discusses fungi v. bacteria, bacteria v. bacteria, inhibitions in soil micro-organ-

isms, associations of micro-organisms within the living plant and on wood, self-inhibition, effects of competition, stimulation, accessory effects, the causes of staling and inhibition, purification and study of the properties of inhibitory agents, possible applications of the data discussed, and terminology. "Micro-organisms in their metabolism give off byproducts, many of which are inhibitory in nature; some have stimulatory effects. These products and activities properly controlled will give us much insight into the proper care of cultures, a natural and effective method of controlling some diseases, and, possibly, chemical products of economic value."

Respiratory block in the dormant spores of Neurospora tetrasperma, D. R. Goddard and P. E. Smith (*Plant Physiol., 13 (1938), No. 2, pp. 241–264, figs. 5*).—The respiratory rates at various partial pressures of oxygen and CO_2 indicated that permeability of the ascospores to gases is not limiting. Studies of the cyanide and CO sensitivity of dormant and activated spores indicated that pheohemin (indophenol oxidase) activity also is not limiting. The dormant spores produced no CO_2 anaerobically, while the activated spores had a $Q_{CO_2}^{N_2}$ of 5:8, though the rate fell to zero after 3–4 hr. It is suggested that no active carboxylase occurs in dormant spores, but that it is reversibly activated on heat treatment. The activation-deactivation of carboxylase parallels the effect of activation and deactivation on respiration and germination.

The results reported are taken to mean that two qualitatively different respiratory systems are present, viz, the dormant system, functioning in the absence of carboxylase, and a system, active in heat-treated spores, which passes over the enzyme carboxylase. The respiratory block is, then, the inactivity of this enzyme.

The classification of acid-fast bacteria, [I], II. (Cornell Univ.). (*Jour. Bact., 34 (1937), No. 6, pp. 617–630, figs. 5; 36 (1938), No. 1, pp. 39–46*).—In part 1, by R. E. Gordon, "the cultural reactions of a collection of 252 saprophytic, acid-fast cultures from soil, plants, human and animal tissues and secretions have been studied in an endeavor to find standards for the classification of the saprophytic mycobacteria. Eighty percent of the strains were readily separated into three groups of closely related cultures. The remaining 20 percent of the strains, which differed from the above and in most cases from each other, were arbitrarily distributed among the three major groups as subgroups." In part 2, by R. E. Gordon and W. A. Hagan, 79 acid-fast cultures from cases of human and rat leprosy, bovine tissue, sputum, fish, water, and soil were separated into 2 major groups according to previously set standards. Sixty-five cultures (82 percent) were readily assigned to closely related groups. The remaining 14 strains were arbitrarily distributed among 4 heterogeneous subgroups.

Apparatus for studying water-relations in potted plants, L. A. Richards and M. B. Russell. (Iowa Expt. Sta.). (*Amer. Geophys. Union Trans., 18 (1937), pt. 2, pp. 588–599, figs. 4*).—The apparatus described and illustrated was developed to obtain information on the flow and distribution of water in soil as influenced by the moisture absorption of plant roots, and on the operating characteristics of double-walled irrigators developed for the purpose of securing automatic control of soil moisture for potted plants.

Apparatus for studying effects of low concentrations of gases on plants and animals, C. Setterstrom and P. W. Zimmerman (*Contrib. Boyce Thompson Inst., 9 (1938), No. 3, pp. 161–169, figs. 3*).—An apparatus for studying the effects of long exposure of plants or animals to various gases, described and illustrated in detail, is reported to have given satisfactory service for over a year of almost continuous operation with SO_2 concentrations of 0.10–60 p. p. m.

A low light intensity photoelectric device for the measurement of leaf areas, R. P. HIBBARD, B. H. GRIGSBY, and W. G. KECK. (Mich. State Col.). (*Mich. Acad. Sci., Arts. and Letters, Papers, 23 (1937), pp. 141–147, pl. 1, figs. 2*).—This device is described.

GENETICS

Breeding to meet economic needs (*Amer. Nat., 72 (1938), No. 740, pp. 243–292, figs. 9*).—Three papers presented at the symposium of the Genetics Society of America at Indianapolis, Ind., December 30, 1937, are given.

Methods applicable to the improvement of live stock, H. D. Goodale (pp. 243–267).—Progress in breeding for increased weight in mice (see page 611), increased egg production in poultry, and increased milk production in dairy cattle at the Mount Hope Farm, Williamstown, Mass., is taken with the results of other similar investigations to show the possibilities of genotypic selection as practiced in the family method of breeding for the improvement of qualities of economic importance in livestock. The family method involves selection on the basis of the phenotypic characteristics of the individual and similar characteristics of the full sibs and progeny.

The geneticist's objectives in poultry improvement, F. B. Hutt (pp. 268–284).—The author lists as the especially important objectives of a progeny testing program increased viability of pullets, extension of productive life, increased hatchability, efficient feed utilization, and association of desired traits with morphological and environmental conditions.

The use of the backcross in crop improvement, F. N. Briggs (pp. 285–292).—The backcross method is suggested, especially for the addition of desired characteristics to crops in which highly productive varieties have already been developed.

What are the genes?—I, The genetic and evolutionary picture, A. GULICK (*Quart. Rev. Biol., 13 (1938), No. 1, pp. 1–18, figs. 3*).—A theory involving a limited number of genes with qualitative differences in molecular arrangement being responsible for mutations is presented.

Sex and genes, W. E. CASTLE (*Sci. Mo., 46 (1938), No. 4, pp. 344–350*).—The attraction between the gametes of various plants and animals is attributed to differences of various kinds. In sex differentiation in mammals maleness is dominant, and in birds and moths femaleness is dominant. Exceptional cases are discussed.

The number and Mendelian ratios of phenotypes and genotypes, K. E. and A. VON P. ROSINGER (*Quart. Rev. Biol., 13 (1938), No. 1, pp. 65–73*).—Novel and convenient tables show the ratios of phenotypes and genotypes expected in the segregating generations in crosses with variable numbers of pairs of Mendelian factors.

Use of chemicals in plant breeding opens up new possibilities, B. R. NEBEL and M. L. RUTTLE (*Farm Res.* [*New York State Sta.*], *4 (1938), No. 3, pp. 6, 7, fig. 1*.—This is a note on the historical use of colchicine in medicine, the more recent studies of its effects on cells (particularly chromosomes), the revolutionary applications to plant breeding which are being initiated and which are deemed sure to lead to results of outstanding economic importance, and on the authors' recent work in developing new forms of marigolds, snapdragons, pinks, petunias, tomatoes, corn, and clover through the artificial inducement of polyploidy by this alkaloid.

The somatic chromosome complement of Habranthus robustus, W. S. FLORY. (Tex. Expt. Sta.). (*Amer. Jour. Bot., 25 (1938), No. 5, pp. 386–388, figs. 7*).—A brief discussion.

Preliminary report on inheritance of differential ability of inbred lines of Sudan grass to produce HCN, O. H. COLEMAN and D. W. ROBERTSON (*Colorado Sta. Tech. Bul. 24 (1938), pp. 8, figs. 2*).—That the differential ability to produce HCN may be inherited in inbred lines of Sudan grass was indicated by a progeny test of S_3 and S_4 lines. Soil and seasonal differences seemed to influence the production of HCN in inbred lines. High HCN production, in the lines studied, appeared to be associated more closely with nonglossy leaves than with glossy leaves and to a lesser degree with purple-tipped seedling leaves.

Some theoretical results of continued brother-sister mating, J. B. S. HALDANE (*Jour. Genet., 34 (1937), No. 2, pp. 265–274, fig. 1*).—Consideration is given to the theoretical possibilities of attaining a given degree of homozygosis when more than two allels are concerned. One or two generations more are required to attain the same degree of homozygosis between mates as between genes in the same individual.

The sex ratio in mules and other hybrid mammals, W. A. CRAFT. (Wis. and Okla. Expt. Stas. et al.). (*Quart. Rev. Biol., 13 (1938), No. 1, pp. 19–40, fig. 1*).—Records from 11 cooperating institutions and 1 horse farm showed that 1,249 horse foals born dead or alive were 52.52±0.95 percent males, whereas records obtained on 1,416 mules showed that there were among these 44.28±0.89 percent males. Among the still-born horse foals 77.5±4.4 percent were males. Sex ratios in various mammals, including especially species hybrids, are compiled from various sources which point toward a higher primary sex ratio with greater fetal mortality in males. Three reasons for this greater sex mortality are given as follows: (1) Expression of sex-linked lethals, (2) Y chromosome carries no genes and the male therefore has fewer dominants, and (3) higher rate of metabolism in males is more injurious in the heterogametic sex with less favorable gene balance. A greater mortality of the heterogametic sex because of general imbalance is expected in interspecies hybrids.

On the inheritance of hair color in the dog [trans. title], H. K. ENGLERT (*Kleintier u. Pelztier, 14 (1938), No. 2, pp. [4]+38*).—A compilation of the color characters in dogs and their mode of inheritance, including the genotype of the different breeds for hair color.

The inheritance of dew claws in the dog, C. E. KEELER and H. C. TRIMBLE (*Jour. Heredity, 29 (1938), No. 4, pp. 145–148, figs. 3*).—Dew claws, representing the reappearance of the first digit on the hind feet of dogs, were considered to represent a character of variable dominance. The character was expressed in 47.6 percent of the heterozygotes and in 58.3 percent of the F_2s from an outcross to non-dew-claw stock.

A study of the inheritance of body weight in the albino mouse by selection, H. D. GOODALE (*Jour. Heredity, 29 (1938), No. 3, pp. 101–112, figs. 3*).—Continuing studies of the role of selection in bringing about changes (E. S. R., 78, p. 610), it was found possible to increase the weight of mice materially by systematic genotypic selection. The first 500 male mice born from 1930 to 1932 averaged 26 g at 2 mo. of age. There was a steady increase during from 12 to 16 generations until the last 500 males born in 1937 averaged 36.4 g. The heaviest male weighed 48.1 g, whereas the heaviest male in the first 500 progeny weighed 31 g, less than the average of the last 500. The variability seemed to be increasing and consequently offered further opportunity for segregation and selection. Considering the distribution observed and the weights of the heaviest mice, the operation of at least 32 pairs of weight genes was indicated. The possibility that the large mice are due to segregation and the accumulation of recessive genes is discussed and considered doubtful for several reasons. The multiple-factor hypothesis is deemed to furnish a better explana-

tion. At the same time, it is pointed out that the progressive selection may have resulted from successive gene mutations or some processes other than the accumulation of genes. The relations of genotypic selection to evolution and livestock improvement are discussed.

The genetics of cancer in mice, J. J. BITTNER (*Quart. Rev. Biol., 13 (1938), No. 1, pp. 51–64, fig. 1*).—A presentation is given of results obtained in studies of the inheritance of the various types of tumors in mice, many of which have been previously noted (E. S. R., 77, p. 768).

Spontaneous tail amputation in the Norway rat, G. W. WOOLEY and L. J. COLE. (Wis. Expt. Sta. et al.). (*Jour. Heredity, 29 (1938), No. 4, pp. 123–127, figs. 3*).—A condition in the rat involving the furrowing of the tail at about 10 days of age, followed by spontaneous amputation at the deepest groove at about 3 weeks of age, is described. Rats of this type have been observed in several laboratories, and various methods of prevention have been tried. Defective and nondefective strains have been raised under like conditions without the amputated tails, appearing in nondefective strains. The condition seemed to be recessive and appeared in the F_2 generation from crosses of defective and nondefective strains. Seasonal variations in expression of the condition were noted.

Growth in weight and cell number: Genetic effects in the chick embryo and chick, T. C. BYERLY, W. G. HELSEL, and J. P. QUINN. (U. S. D. A.). (*Jour. Expt. Zool., 78 (1938), No. 2, pp. 185–203, figs. 2*).—A study was made at Beltsville, Md., of the weights of embryos and cell numbers per unit of area from the liver and neural tube of embryos after from 2 to 20 days of incubation and up to 10 weeks of age from Silkies, Single Comb Rhode Island Reds, and reciprocal crosses between them. The average weights of the Rhode Island Red eggs were considerably greater than the average weights of the Silkie eggs, and the embryos in the Rhode Island Red eggs grew more rapidly than in Silkie eggs whether they were purebred or hybrid. Evidently the egg is a more important factor in determining embryo size than genetic constitution for adult size. Size differences in the embryos did not appear during the first week of incubation, but during the 11- to 17-day period genetically larger embryos were generally heavier than genetically smaller embryos, even in eggs of similar weight. Hatching weight was a closely related factor to egg weight. The growth rates after hatching were similar for all groups, but the rate dropped after 2 weeks for Silkies, after 4 weeks for Silkie ♂ × Single Comb Rhode Island Red ♀, and after 6 weeks for Single Comb Rhode Island Reds and Single Comb Rhode Island Red ♂ × Silkie ♀. The logarithm of the embryonic weight plotted against the logarithm of age was linear. There was no evidence of inherent differences in rate of cell division in birds of genetically different mature sizes. Cell counts were made on White Leghorn embryos, as well as on the other breeds and crosses.

Spermatogenesis in a sex-reversed female and in normal males of the domestic fowl, Gallus domesticus, R. A. MILLER (*Anat. Rec., 70 (1938), No. 2, pp. 155–189, pls. 3, figs. 34*).—Spermatogenesis in the remaining testislike right gonad of a Buff Orpington female chick having the ovary removed at 4 days of age is described. The bird was killed at 10 mo. 25 days of age after having received 14 daily injections of pregnant mare serum. After ovariectomy the right gonad hypertrophied into a testislike structure in which spermatogenesis occurred. Spermatogenesis in normal males is described, including study of the number and morphology of the chromosomes. It was found that the germ cells, differentiated into spermatozoa in the right gonad of the female, still retained the female chromosome complex. The sex chromosome was never

seen to divide in the reduction, nor was it paired with a smaller chromosome. Spermatogonial chromosome counts varied from 51 to 60, and spermatocyte counts (haploid number) were most often 40.

On asymmetric spur development in fowls, C. J. Bond (*Jour. Genet., 34 (1937), No. 2, pp. 229–235, pls. 2*).—A study of spur development in 20 female progeny of 10 hens with spurs mated to a Brown Leghorn and a Houdan five-toed cock showed that there were 11 with symmetric or asymmetric spur growth. Apparently, a greater percentage of the females had spurs than would be expected in general breeding stock. The female birds with spurs commenced to develop them at from 12 to 18 mo. of age. Although asymmetric spur development was common in females, no case of asymmetry was observed in males. In asymmetric spur development the leg bones on the spur side tend to assume a more massive and heavier character. Citing a gynandromorphic pheasant and other cases, it seems that the somatic tissue on the two sides of the body may respond differently to hormone influences. As the majority of cases of one-side spur growth have occurred in the F_1 and F_2 generations of crossbreds, it is suggested that the asymmetry results from the interaction between heterozygosis and the instability of the genetic constitution of the female (*XY*). The case of asymmetry in spur development seems to be one of genetic differences in response to hormones.

Pedigree breeding and inbreeding in fowls, I, A. G. Dumon (*Agricultura [Louvain], 41 (1938), No. 1, pp. 11–41, figs. 2; Dutch abs., pp. 25, 26; Eng. abs., pp. 27, 28*).—Data are reported on the hatchability and weights of birds in brother × sister, dam × son, daughter × sire, half brother × half sister, and nonrelated matings. Little, if any, deleterious effect from inbreeding was evident.

A test of crossbred chickens, Single Comb White Leghorns and Rhode Island Reds, C. W. Knox and M. W. Olsen. (U. S. D. A.). (*Poultry Sci., 17 (1938), No. 3, pp. 193–199*).—Comparison was made at Beltsville, Md., of the size and egg production of purebred Rhode Island Red and Single Comb White Leghorn fowls and crossbreds between several general purpose breeds and White Leghorns mated with Rhode Island Reds, Black Minorcas, and White Plymouth Rocks. The eggs from which the birds were hatched were procured from breeders selling the different kinds of eggs. The average hybrid was superior to the purebreds in early body weight and viability, but egg production of hybrids was less than that for purebreds and the percentage of broodiness among crossbreds was much greater. Progeny from crosses of general purpose breeds were generally superior to the progeny from the White Leghorn crosses. It was evident that different results might be obtained from crossing different strains from the same breeds.

Precipitation test for a generic hybrid between guinea hen and Leghorn cock, K. Sasaki (*Ztschr. Zücht., Reihe B, Tierzücht. u. Züchtungsbiol., 38 (1937), No. 3, pp. 361–365, fig. 1*).—Sera from the guinea fowl and the Leghorn were found to possess proteins that are species specific when employed in the precipitation test. Both proteins were present in the serum of a hybrid of unknown sex produced by crossing a Pearl guinea hen with a White Leghorn cock, but no new specific protein was found therein.

Immuno-genetic studies of species relationships in Columbidae, M. R. Irwin. (Wis. Expt. Sta.). (*Jour. Genet., 35 (1938), No. 3, pp. 351–373, figs. 7*).—Continuing these studies (E. S. R., 76, p. 319), the species-specific and homologous characters in the erythrocytes are shown graphically and compared for four species of Columbidae, Pearlneck, ringdove, *Columba livia*, and *C. guinea*. Some cellular substances were found common to all four species, and others

Cytological abnormalities in the oocytes of the 3-week kitten's ovary, M. E. SNEIDER (*Anat. Rec., 70 (1937), No. 1, pp. 13–27, pls. 3, figs. 3*).—Description is given of cytological abnormalities observed in the primary oocytes of 14 kittens killed at approximately 3 weeks of age. The abnormalities considered indicative of degenerative processes were grouped as (1) multipolar mitoses, (2) bipolar mitoses exhibiting certain chromosomal irregularities, (3) tetradlike chromosomes, (4) multinucleate cells, and (5) pycnosis and vacuolation.

Experimentally produced sterile gonads and the problem of the origin of germ cells in the chick embryo, B. H. WILLIER (*Anat. Rec., 70 (1937), No. 1, pp. 89–112, figs. 5*).—Tests were made of the development of isolated portions of chick blastoderms in chorioallantoic grafts. Gonads were differentiated, consisting of malelike sex cords, but they were invariably sterile due, in part, to the lack of a mechanism for transporting the primordial germ cells to the developing gonad areas. It seems evident that a gonad rudiment may arise and differentiate independently of the primordial germ cells, but the invariable formation of primary male sex cords and the inability to form ovarian cortex present a significant problem.

The effects of jarring upon the embryogeny of chick embryos, K. A. STILES and R. L. WATTERSON (*Anat. Rec., 70 (1937), No. 1, pp. 7–12, figs. 2*).—Jarring eggs with a 490-g hammer for 1 min. at 15-min. intervals from the fourth to the twelfth hour of incubation reduced hatchability from an average of 45 percent so that only 1 egg in 155 hatched. The vitelline circulation and various parts of the nervous system were especially sensitive. Serial sections of 72-hr. embryos showed lack of vitelline circulation and the trapping of the normally free-moving corpuscles in blood islands. About 60 percent of the embryos died between the second and third days, and others ceased developing up to 11 days.

Fowl sperm immobilization by a temperature-media interaction and its biological significance, S. S. MUNRO (*Quart. Jour. Expt. Physiol., 27 (1938), No. 3, pp. 281–291, fig. 1*).—Variations of the relative motility of 2,048 samples of fowl sperm in different dilutions and at different temperatures showed the importance of a temperature-media interaction. The temperatures ranged from about freezing to 105° F. Motility was decreased at both the high and low temperatures but was resumed when intermediate temperatures were restored. On the other hand, rat and guinea pig sperm exhibited a different temperature response in that motility was increased at body temperature, a characteristic of mammalian sperm as contrasted with that from birds, where the testes are in the abdominal cavity. The fluids appearing to support motility best at all levels, including 105°, were distilled water, semen without diluent, sperm serum, blood serum, and shell gland fluid. The sperm were immotile at 105° in the oviduct and infundibulum juice, permitting storage for the fertilization of eggs laid over a considerable period. The exact nature of the immobilizing mechanism is not clear, but the results suggest that fowl sperm are immobilized in the magnum and infundibulum but are motile in the shell gland area.

Investigations on the morphology and physiology of hair development in the domestic rabbit [trans. title], J. SCHWANITZ (*Ztschr. Morph. u. Ökol. Tiere, 33 (1938), No. 4, pp. 496–526, figs. 19*).—A histological study of hair growth and replacement of new hairs, including the effects of temperature, thyroid hormones, and other factors.

The artificial induction of oestrus in the milk goat during the anoestrus period, T. S. SUTTON and W. R. KRILL (*Ohio Sta. Bul. 592 (1938), p. 89*).—Oestrus was induced during the anoestrous period in does by the administration of from 50 to 100 rat units of gonadotropic substances.

The preparation, properties, and use of gonad-stimulating hormones, L. E. Casida (*Jour. Dairy Sci., 21 (1938), No. 3, pp. 101–108*).—A review of the gonadotropic hormones, particularly as regards their effects when administered to calves. Consideration is given to their preparation and purification.

Gonadotropic hormones in the hereditary dwarf mouse, A. Marshak (*Soc. Expt. Biol. and Med. Proc., 38 (1938), No. 2, pp. 226–228*).—The enlargement of the seminal vesicles in the male dwarf mouse and the development of follicles in the female only to medium size suggest the presence of luteinizing hormone in the pituitary and a complete or partial deficiency of the follicle-stimulating hormone in this animal.

A pharmacological ejaculation test for bio-assay of male sex hormone, S. Loewe (*Soc. Expt. Biol. and Med. Proc., 37 (1937), No. 3, pp. 483–486*).—A new method for bio-assay of the male hormone is suggested based on an ejaculation test induced by the pernostone-yohimbine technic. Testosterone, testosterone propionate, testosterone acetate, and androsterone were assayed by daily injections over a period of 5 days, followed by the ejaculation test. A 50 percent response was considered unity. The advantages of the test are that animals need not be sacrificed, no histological examinations are necessary, and the test may be repeated on the same castrated animals.

Biological differences in the action of synthetic male hormones on the differentiation of sex in the chick embryo, B. H. Willier, M. E. Rawles, and F. C. Koch (*Natl. Acad. Sci. Proc., 24 (1938), No. 4, pp. 176–182, figs. 5*).—Results are briefly presented on the effects of sesame oil and propylene glycol solutions of androsterone, dehydroandrosterone, androstenedione, and testosterone injected into eggs incubated from 43 to 72 hr. on the differentiation of the sex organs of the developing male and female embryos. The androsterone and dehydroandrosterone have both masculinizing and feminizing effects, whereas testosterone propionate has a masculinizing effect only upon the differentiating sex organs and tissues. The first two androgens in genetic males bring about the development of ovarian cortex and persistence of oviducts, but in genetic females they inhibit the development of the same organs. The size of the testes was reduced in genetic males by testosterone propionate, but the strong feminizing action was not evident. Although the degree of intersexuality produced by given doses varied, the smaller doses induced hypertrophy of the right ovary and Wolffian ducts, but larger doses were required to bring about testicular changes in the left ovary.

Effects of thyroxin and female hormone on one phase of saddle feather development, R. M. Fraps (*Soc. Expt. Biol. and Med. Proc., 38 (1938), No. 2, pp. 201–205, fig. 1*).—Continuing the studies of feather growth (E. S. R., 77, p. 610), the effect of thyroxine or female hormone injections on saddle feather growth in the Brown Leghorn male or capon is described.

Germinal basis of thyroxin and female hormone effect on barb origin in saddle feathers, R. M. Fraps (*Soc. Expt. Biol. and Med. Proc., 38 (1938), No. 2, pp. 206–210, figs 5*).—The significance of the influence of thyroxine and female hormone on the origin of barbs in saddle feathers in the Brown Leghorn male and capon is described.

Luteinizing hormone in bird hypophyses, S. L. Leonard (*Soc. Expt. Biol. and Med. Proc., 37 (1937), No. 3, pp. 566–568*).—The administration of doses of 10, 20, 30, 40, and 50 mg of powdered chicken hypophyses to immature female rats was found to increase the weights of the ovaries materially except in the case of the smallest dose. The presence of the luteinizing hormone was made evident by the response of 155 and 222 percent augmentation in the weight of the ovaries when follicle-stimulating hormone was also administered. The

powdered chicken hypophyses induced luteinization in hypophysectomized rats and induced some repair of the atrophied adrenals. All of these results show that the chicken hypophysis is capable of stimulating both follicular growth and luteinization in the rat ovary.

Effects in female young born of pregnant rats injected with androgens, J. B. Hamilton and W. U. Gardner (*Soc. Expt. Biol. and Med. Proc., 37 (1937), No. 3, pp. 570–572, fig. 1*).—Note is made of the occurrence of abnormalities tending toward sex reversal in the female progeny of females injected with testosterone propionate during the last one-third of pregnancy.

Some effects of androsterone on sexual development in the female rat, R. R. Greene, M. W. Burrill, and A. C. Ivy (*Science, 87 (1938), No. 2261, p. 396*).—The administration of androsterone to pregnant rats was found to modify the sexual development of the female embryos. The degree of masculinization seems dependent on the total quantity of androsterone administered and on the period of gestation.

Biological properties of some new derivatives of testosterone, R. Deanesly and A. S. Parkes (*Biochem. Jour., 31 (1937), No. 7, pp. 1161–1164, figs. 2*).—As compared with testosterone and testosterone propionate, testosterone oxime and testosterone oxime propionate were less active in comb-capon tests and in their effects on the prostates and seminal vesicles of rats. Testosterone diacetate was similar to monoacetate in its action on the rat.

Uterine reaction to testosterone in the rat, J. B. Brooksby (*Soc. Expt. Biol. and Med. Proc., 38 (1938), No. 2, pp. 235–237*).—Study of the enlargement of the uterus resulting from testosterone administration showed that normal and ovariectomized rats and animals having the uteri slit reacted similarly, although varying in degree. Only slight enlargement of the uteri followed treatment with progesterone.

Effect of testosterone injections upon the course of pregnancy in unoperated and in castrated rats, E. Scipiades (*Soc. Expt. Biol. and Med. Proc., 37 (1937), No. 1, pp. 242–244*).—Injection of testosterone or testosterone propionate into pregnant rats prevents or delays parturition in the normal pregnant female and prevents abortion that normally follows ovariectomy. The androgen is injurious to the embryos, especially in the larger doses, but does not render the experimental animals sterile.

Effect of anterior pituitary-like hormone on lactation in the albino rat, F. E. Connon (*Soc. Expt. Biol. and Med. Proc., 37 (1937), No. 1, pp. 52–55*).—In studying the effect of anterior pituitarylike hormone in the form of Antuitrin-S on lactation in rats, the minimum effective dose as an inhibitor was found to be about 80 rat units. Where large doses were administered, the suckling young showed reduced gains in weight and few survived to weaning. The stomachs were largely empty, as contrasted with the controls, whose stomachs were filled with milk. Mammary glands of the treated animals were more or less involuted, and the ovaries were enlarged and revealed much luteinization.

Comparison of pituitary gonadotropic extract and prolan on ovarian and uterine response in immature rats, S. K. Chou and S. H. Liu (*Soc. Expt. Biol. and Med. Proc., 37 (1937), No. 1, pp. 228–234, figs. 2*).—On account of the differences in ovarian and uterine responses to gonadotropic extracts from the pituitary and from pregnancy urine, study was made of the effects of three daily doses of either, but containing the same total doses from the two sources. The responses to the two types of extracts followed the same type of logistic curves, but the value of the constants differed markedly. The response in the weight of the uterus was noted with smaller doses than were needed

to show response in the ovarian weight. Smaller doses of prolan gave more positive response than was evident from the pituitary extract. Curves showing weight responses to dosages are suggested for adoption in bioassay.

The morphological basis of pituitary function in pigeons, J. P. Schooley and O. Riddle (*Amer. Jour. Anat., 62 (1938), No. 3, pp. 313–349, pls. 2, figs. 3*).—Study is reported of the histological changes in the anterior lobe of the pituitary of over 200 male and female pigeons and doves through immaturity, resting stages, ovulation, incubation, and feeding of the young. From physiological studies of implanted material, as well as cytological studies, it appears that heavily granulated cells are not related to the potency or storage of hormones. Gonad-stimulating hormone seems to come from basophile cells, and prolactin from acidophile cells.

Some effects of adrenalectomy in fowls, E. H. Herrick and O. Torstveit (Kans. Expt. Sta.). (*Endocrinology, 22 (1938), No. 4, pp. 469–473, figs. 4*).—The effects of adrenalectomy on male fowls were studied in birds kept alive for as long as 82 days by cortical extract and salt solution. Adrenalectomy was followed by loss of color and turgidity of the comb within from 2 to 4 days and a reduction in the size of the testicles. The combs were finally markedly reduced in size, the testes shrunken and cells degenerated, and the sickle and hackle feathers assumed caponlike characteristics.

The endocrine system and plumage types.—I, Some effects of hypothyroidism, A. S. Parkes and H. Selye (*Jour. Genet., 34 (1937), No. 2, pp. 297–306, pls. 2*).—The effects of thyroidectomy on the color and structure of the feathers developing on several breeds of fowls were studied at the National Institute for Medical Research, London. In general, thyroidectomy caused a loss of barbules, giving a fringed appearance to the feather which was also frequently elongated. In the Brown Leghorn there was a replacement of black pigment by red. The black of the feathers of the under surface and wing bar was replaced by white in the Silver Dorking. In the Barnevelder the size of the brown core was much more enlarged. The white spangling on most of the feathers of the Ancona disappeared so that new feathers were solid black. In Sebright Bantam feathers there was a loss in the definition of the black border, and the changes were largely dissimilar to those following gonadectomy. In the Khaki Campbell drake the dark brown feathers of the posterior dorsal area changed to the stippled silver type characteristic of the posterior ventral area. There were no noticeable color changes in the Black Minorca, Black Leghorn, Black Plymouth Rock, or the Barred Plymouth Rock.

FIELD CROPS

[**Field crops experiments in Indiana**], G. P. Walker, R. R. Mulvey, S. R. Miles, C. E. Skiver, W. W. Worzella, G. H. Cutler, A. H. Probst, H. L. Cook, R. R. St. John, and A. T. Wiancko (*Indiana Sta. Rpt. 1937, pp. 23, 24, 25, 26, 27, 38, 39, 78, 79, 80, 82, 83, figs. 2*).—Progress results are reported briefly from field crops research (E. S. R., 77, p. 324), including inheritance studies and winter hardiness tests with wheat; breeding work with wheat, oats, and soybeans; performance and distribution of corn hybrids (coop. U. S. D. A.); a variety test with alfalfa; a fertilizer test with pasture and spring top dressing of wheat and barley with sodium nitrate; sweetclover as an intercrop sown in oats in the spring and plowed under for corn the next spring; culture of winter barley in Indiana; planting tests with corn varieties; response of crops to fertilizers in the rotation corn, soybeans, wheat, and clover; crop rotations; soil fertility studies; studies of wild garlic bulblets in milling wheat; and tests of calcium cyanamide as a herbicide.

Recommended varieties of field crops for New Jersey, H. B. Sprague (*N. J. Stas. Circ. 378 (1938), pp. 15, fig. 1*).—As in an earlier publication (E. S. R., 67, p. 123), varieties and strains of corn, winter barley, wheat and rye, spring barley and oats, alfalfa, red clover, soybeans for grain and hay or silage, and timothy are indicated, with brief descriptions, for different parts of New Jersey.

[**Agronomic research in Ohio**]. (Partly coop. U. S. D. A.). (*Ohio Sta. Bul. 592 (1938), pp. 16–19, 21–26, 27–29, 31–33, 62–64, 123–125, figs. 2*).—Brief progress reports are given again (E. S. R., 77, p. 615) from experiments with field crops dealing with the effects of adding a sweetclover green manure crop to a corn-oats rotation, by R. M. Salter; effects of delayed applications of complete fertilizers on corn, by G. M. McClure; differential response of wheat strains to season and to spacing of rows, by C. A. Lamb; experiments with hybrid corn, by G. H. Stringfield; performance of early varieties of oats, by J. B. Park; tests of Thorne and other new wheats for quality, by E. G. Bayfield; comparison of livestock v. grain farming, by C. G. Williams; merits of white clover strains, by D. R. Dodd; some effects of crop rotations on yields and soil nitrogen, by L. E. Thatcher and Salter; tests of new productive potato varieties and Ohio-grown Irish Cobblers, and of subsoil application of fertilizers for potatoes, all by J. Bushnell; and variety tests with corn, wheat, and oats, tests of timothy and alfalfa-grass combinations for hay, with cutting tests, and maintenance of soil fertility in fertilized rotations, all by M. A. Bachtell.

[**Crop production experiments at the Puerto Rico College Station**], P. Richardson Kuntz, F. Chardón, E. Molinary Sales, F. Méndez, J. Pastor Rodríguez, A. Roque, C. J. Clavell, and A. Riollano (*Puerto Rico Col. Sta. Rpt. 1937, pp. 14–24, 56–59, 60–65, 66, 67, 68–73, 118–122, 150–153, 154, 158, 159, 163–165*).—Work with field crops (E. S. R., 78, p. 326) reported on from the station and the Isabela Substation comprised variety, uniformity, irrigation, fertilizer, soil reaction, trash disposal, and green manuring (*Crotalaria striata*) tests, all with sugarcane; planting tests with cotton and sweetpotatoes; forage production of four legumes at two growth stages and of six variously fertilized grasses on hillsides and lowland; fertilizer tests with corn, cotton, yams, and potatoes; breeding work with corn, cotton, beans, tobacco, and sugarcane; variety trials with tobacco, sweetpotatoes (for yield and starch content), legumes for cover crops, cassava, yams, and with yautias; and cooking tests with sweetpotatoes, yautias, and soybeans.

[**Field crops research in Wisconsin, 1936–37**]. (Partly coop. U. S. D. A.). (*Wisconsin Sta. Bul. 440 (1938), pp. 34, 35, 38, 39, 58–72, 74–76, 83–87, figs. 8*).—Reports of progress are made from agronomic work (E. S. R., 77, p. 473; 78, p. 775) at the station and substations, including fertilizing and manuring experiments with tobacco, by J. Johnson and W. B. Ogden; factors influencing the amount of and a test for hydrocyanic acid in Sudan grass and a pasture plan to avoid danger, all by F. T. Boyd, O. S. Aamodt, E. Truog, G. Bohstedt, and K. P. Link; development of improved strains of Sudan grass, by H. L. Ahlgren and Aamodt; pasture investigations involving measurement of response to different management practices by milk production and gains or losses by dairy cows, by Aamodt, Ahlgren, I. W. Rupel, Bohstedt, E. J. Graul, and F. W. Tinney; rotational grazing of bluegrass pasture with supplementary pasture, by Ahlgren, Aamodt, and Rupel; response of bluegrass to fertilizer, especially nitrogen, by Graul; cutting experiments with alfalfa, by L. F. Graber and V. G. Sprague; seeding tests with alfalfa, by E. J. Delwiche; tests of the resistance of alfalfa varieties to *Lygus* bugs, by Aamodt, cooperating with J. Carlson of the Utah Station, and to ice sheet injury, by R. A. Brink, W. Keller, and C. Eisenhart; breeding nonbitter sweetclover, by W. K. Smith,

Brink, H. A. Campbell, and Link, and common sweetclover, by V. C. Brink; tests of the adaptation of red clover strains to Wisconsin, by Aamodt and J. H. Torrie; development of drought-resistant hybrid corn, by N. P. Neal; the influence of sun red color pigment on corn yields, by R. A. Brink; development of Imperial (Wisconsin Pedigree No. 6) winter rye, by B. D. Leith, and comparative tests with it and other ryes, by A. R. Albert; seeding tests with oats, barley, wheat, and peas, by Delwiche; variety tests with barley, by Leith; breeding work with potatoes, by G. H. Rieman, cooperating with R. H. Larson, J. C. Walker, and T. C. Allen; demonstration of the superiority of peat-grown seed potatoes, by Larson and Walker; tests of potato varieties on light sandy soil, by Albert; and a study of lack of boron in the soil as a factor in the blackening of potatoes, by W. E. Tottingham and A. F. Ross.

Natural selection within plant species as exemplified in a permanent pasture, W. B. Kemp. (Md. Expt. Sta.). (*Jour. Heredity, 28 (1937), No. 10, pp. 329–333, pl. 1, figs. 4*).—Manifestations of differences in growth of bluegrass, white clover, and orchard grass found associated with differences in grazing suggested that a high degree of natural selection within each species operates in the permanent pasture. It appeared that strains may be isolated which can survive under the closest grazing by horses and cattle, but it remains to be determined whether they can yield enough to justify isolation and use.

An investigation of the methods of botanical analysis of pasture, O. West (*So. African Jour. Sci., 33 (1936), pp. 501–559, figs. 24*).—The applicability of methods of pasture analysis to the study of grass veld in South Africa was investigated. Adaptations to meet local conditions are suggested, and a procedure, the "percentage area transect method", is described. The use of a comparatively small quadrat was shown to reduce greatly the work needed for accuracy. The 25 dm^2 quadrat (2.7 sq. ft.) proved the most suitable size for the Frankewald Purple Veld. For the rare species on the veld, a random distribution was obtained for all quadrat sizes from 1 dm^2 upward, while for the abundant bunchy species the distribution was random when the quadrat is 25 dm^2 or larger but not for quadrat sizes less than 25 $dm.^2$ A bibliography is included.

List of grasses (Gramineae) of the Ottawa District, W. G. Dore and H. Groh (*Canad. Field Nat., 52 (1938), No. 4, pp. 53–55*).—This annotated list is arranged alphabetically by Latin names.

Survival of several alfalfa varieties seeded on irrigated land infested with bacterial wilt, R. M. Weihing, D. W. Robertson, and O. H. Coleman (*Colorado Sta. Tech. Bul. 23 (1938), pp. 12*).—The survival of varieties of alfalfa was studied in 10 varietal trials, 1929–37, seeded at or near Fort Collins, Colo. The stands of most varieties were too thin for hay production after the third or fourth year of harvest. Hardistan survived and remained productive for one or two years longer. A commercial strain (No. 2674 of Turkestan) seemed to follow in survival. The survival rank from high to low counts of variegated strains was Ladak, Meeker Baltic, Cossack, Ontario Variegated, Grimm, and Hardigan, and for common alfalfas Nebraska, Colorado, Idaho, Montana, Utah, New Mexico, Kansas, and Arizona. Survival of Chilean and Argentine was as low as any of the varieties. There seemed to be little difference in average survival of these variegated and common strains on wilt-infested land. Statistical analysis indicated that stand counts on two quadrats per plat sufficed for information on variety survival under the experimental conditions.

Variability in germination of freshly harvested Avena, F. A. Coffman and T. R. Stanton. (U. S. D. A.). (*Jour. Agr. Res. [U. S.], 57 (1938), No. 1, pp. 57–72*).—The freshly harvested seed of varieties of *A. sativa* showed all degrees

of prompt, slow, and delayed germination, and seed of varieties of *A. byzantina*, *A. fatua*, and *A. sterilis* showed slow or delayed germination. Liberty Hull-less (*A. nuda*) germinated promptly. After storage for from 7 to 10 weeks after harvest, all varieties except Fulghum, Victoria, and *A. sterilis ludoviciana* showed a high 7-day germination. Dormancy was no longer noted in many varieties after 4 weeks' storage. No Nortex seed stored less than 66 days germinated satisfactorily, thus explaining the poor field stands often obtained after planting freshly harvested seed of Red Rustproof strains.

Delayed germination was not associated definitely with time of maturity, growth habit, or cold resistance, and in many sorts apparently resulted largely from factors other than moisture content of the seed. Varieties with dark-colored kernels, prominent basal scars, and numerous basal hairs on the primary kernels, characters common to oats belonging to *A. fatua*, *A. sterilis*, and *A. byzantina*, were slow in germination. Varieties germinating promptly had kernels medium in size. When freshly harvested the primary kernels germinated more promptly than the small and younger secondary kernels of the spikelet, but the difference was less evident after a few days' storage.

Experiments with modified techniques for the determination of purity and viability of bluegrass seed, *Poa pratensis* L., R. H. PORTER. (Coop. U. S. D. A.). (*Iowa Sta. Res. Bul. 235 (1938), pp. 89–111, fig. 1*).—A close approximation of pure bluegrass seed could be obtained by modified procedure involving separation of unattached infertile florets or spikelets from fertile florets by a uniform speed motor and fan and a vertical air blast separator of the Holland type. Removal of pieces of stem, grit, stones, weeds, and other crop seeds from the heavy portion is the only hand labor involved. In general, the percentages of heavy and pure seed fractions fall within the range of natural variability, indicating that the uniform speed motor and fan provide a reasonably constant air pressure. Similar response by samples ranging from 16 to 27 lb. in bushel weight suggested weight per bushel for these samples was controlled more by amount of empty florets present than by immature or lightweight seed. Seed weighing 10 lb. required a stronger air blast to remove infertile florets than did heavier seed. Each of eight seed laboratories using the modified method with a similar subsample previously blown to aid in calibration of each blower obtained purity percentages within the range of natural variability. Difficulties involved in the application of the proposed method to seed laboratory practice and its advantages are discussed.

Germination tests of nonfresh bluegrass seed indicated that sterile sand saturated with distilled water in Petri dishes is slightly superior as a substratum to filter paper moistened with distilled water or with 0.2 percent KNO_3 solution. Copper trays equipped with wicks to maintain a constant supply of water are equal to sand, according to limited tests. Total germination was significantly higher on sand than on filter papers at 10, 15, and 20 days after the tests began; mean germination at the end of 15 days on sand about equaled that on filter papers at the end of 28 days.

The effect of a limited supply of phosphorus on the nitrate-reducing ability of Kentucky blue grass, B. P. WALTNER (*S. Dak. Acad. Sci. Proc., 17 (1937), pp. 39–41*).—A decrease in nitrate-reducing ability of above-ground parts occurred in 1-gal. glass-crock sand cultures during the day and an increase at night, with the reverse in underground parts. Reductase activity proved to be largely in the underground parts, but seemed to be influenced by carbohydrate synthesis in the leaves. Juices of phosphorus-deficient plants could reduce nitrates to nitrites to a greater degree than those of plus-phosphorus plants. High temperature in relation to phosphorus supply is also discussed.

Management of Kansas bluestem pastures, A. E. Aldous. (Kans. Expt. Sta.). (*Jour. Amer. Soc. Agron., 30 (1938), No. 3, pp. 244–253*).—Grazing experiments were initiated in 1916 to determine management methods that would maintain the grazing value of the large area (about 5 million acres) of the Kansas bluestem pastures. Deferring grazing every year until about June 15 gave an increase of about 25 percent in carrying capacity and 33 percent increase in gains in pounds of livestock per acre over that obtained in the pastures grazed the season long. Desirable forage species were maintained equally as well in both types of grazing. In crude protein and their mineral content, the bluestem grasses were found high enough in their leafy stages of growth for the nutritional requirements of livestock and to provide satisfactory gains in weight. Clipping experiments showed the yield of the tops and roots to be inversely proportional to frequency of clipping. The density of desirable grasses and their food reserves were about in the same proportion. A deferred system of grazing evidently may be used to obtain the highest use of the bluestem pastures with the minimum injury.

Crimson clover, E. A. Hollowell (*U. S. Dept. Agr. Leaflet 160 (1938), pp. 8, figs. 6*).—Practices for growing crimson clover (*Trifolium incarnatum*) for pasturage, hay, green manure, and seed are outlined with information on its characteristics, adaptation, and diseases and insects.

The absorption and utilization of nitrate nitrogen during vegetative growth by Illinois high protein and Illinois low protein corn, I. R. Hoener and E. E. DeTurk. (Ill. Expt. Sta.). (*Jour. Amer. Soc. Agron., 30 (1938), No. 3, pp. 232–243, figs. 3*).—When plants of two strains of white dent corn, differing widely in the protein content of mature grain grown on relatively productive soils and selected through 40 generations for high- and low-protein content, were grown in water cultures containing, respectively, 25, 50, 100, and 200 p. p. m. of nitrate nitrogen, green and dry weights of plants increased somewhat with increasing nitrate supply. Total nitrogen per plant and the water-insoluble and residual water-soluble nitrogen fractions as well as nitrates showed similar trends, indicating a distinct superiority of the high protein corn in assimilation as well as absorption at the 100 p. p. m. nitrogen feeding level. This superiority tended to disappear at lower or higher feeding levels. Ammonia and amides were low in the plant tissue and varied only slightly at the different feeding levels, indicating that they are intermediate stages in protein synthesis and are used up about as fast as formed. The formation of amides may serve to prevent toxic concentrations of ammonia in the plant tissues. The possibility of combining soil improvement and corn breeding studies in order to secure the benefit of the maximum combined producing capacity of both crop and soil is discussed.

The relation of fertilizers to the cotton plant produced in the blackland prairie section of Texas, H. V. Jordan, J. H. Hunter, and J. E. Adams (U. S. D. A.). (*Jour. Amer. Soc. Agron., 30 (1938), No. 3, pp. 254–262*).—Cotton was grown on Wilson clay loam, Wilson fine sandy loam, and Houston black clay soils, using fertilizers of 0–15–0, 3–9–3, 9–3–3, and 15–0–0 formulas. On the Wilson soil, the 15–0–0 and 9–3–3 fertilizers reduced the number of plants killed by root rot and the 0–15–0 increased the mortality. The 3–9–3 ratio might either increase or decrease the kill as shown by individual records, but a summation indicated an unimportant increase. Differences on the Houston soil were confined to the 0–15–0 and 3–9–3 ratios.

Phosphate alone and complete fertilizers accelerated plant development when plant height and numbers of squares and bolls served as indices. On the Houston soil the effect was produced by the 3–9–3, 0–15–0, and 9–3–3 fertilizers. Nitrogen alone (15–0–0) only tended to delay development. A correlation of

an acceleration of plant development and the incidence of root rot was indicated for the 0–15–0 fertilizer. The variable relation of the complete ratios and the tendencies for the 15–0–0 ratio are discussed.

Improved strains of Acala cotton for New Mexico, G. N. STROMAN (*New Mexico Sta. Bul. 256 (1938), pp. 46, figs. 3*).—Results of tests of strains of Acala cotton, developed in the course of breeding work (E. S. R., 72, p. 763) at the station, 1928–36, here summarized, showed that certain strains were earlier and of better quality than the commonly grown College Acala but were no better in boll weight, lint percentage, and lint index. Seed of strain 1064 under the name of Acala 37A, which seemed to be adapted better to the Roswell area, was released to selected growers in the Pecos Valley in the spring of 1938, the increase of the seed making possible a general distribution in that valley for the 1939 crop. Strain 1517 was to be increased at State College in 1938 and the seed distributed to certain farmers in the Mesilla Valley for their 1939 crop.

A new method of delinting cottonseed with sulfuric acid, N. I. HANCOCK. (Coop. U. S. D. A.). (*Tennessee Sta. Circ. 61 (1938), pp. 8, figs. 6*).—The construction of an inexpensive seed-delinting drum is described with advice on its operation, planting rates, and the advantages and disadvantages of acid-delinted seed. Such seed usually germinated faster than fuzzy seed in tests made in 1936–37 in cooperation with D. M. Simpson and gave almost perfect stands.

The effect of certain seed treatments on the germination of recently harvested potato seeds, H. L. STIER. (Md. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 601–605*).—Continued studies (E. S. R., 78, p. 40) showed the germination responses of new potato seed to treatments with chemicals, storage conditions, heat and desiccation, nondrying, and various germination temperatures. It is concluded that the factor involved in delayed germination probably concerned availability of oxygen to the embryo. Results obtained by testa removal and radicle excision suggested that the tissue inhibiting oxygen absorption was that formed by the thick outer walls of the nucellar layer. Presumably some change occurs in this layer from harvest until from 200 to 300 days later which permits oxygen to pass through rapidly enough to promote germination. The increase in rate of germination incident to removal of the testa is thought to be the result of puncture of the nucellar membrane when the testa was removed.

The Mesaba potato, F. A. KRANTZ and A. G. TOLAAS. (Minn. Expt. Sta., U. S. D. A., et al.). (*Amer. Potato Jour., 15 (1938), No. 4, pp. 89–91*).—The Mesaba potato was obtained from a cross between Russet Rural and a seedling selection of Early Ohio and has been tested most extensively in Minnesota and Iowa. It is a round white potato of the smooth Rural type, similar to Irish Cobbler in maturity and yield. At many locations in Minnesota Mesaba has proved to be a smoother, more attractive market potato than Cobbler. It is resistant to some virus diseases and susceptible to others.

Soil fertilizer and nutrition studies with the potato in 1937, O. SMITH. (Cornell Univ.). (*Amer. Potato Jour., 15 (1938), No. 4, pp. 99–109*).—Summarizing invesigations on fertilizers and fertilization, soil reaction, soil fertility, cover crops, and sand and solution cultures with the potato, this report lists 74 titles.

Some factors influencing the composition of Colorado potatoes, C. H. METZGER, J. W. TOBISKA, E. DOUGLASS, and C. E. VAIL. (Colo. Expt. Sta.). (*Amer Soc. Hort. Sci Proc., 34 (1937), pp. 635–643*).—Significant differences in the composition of potatoes were demonstrated when four varieties were grown, 1934–36, in five localities in Colorado. Potatoes from one locality might differ in starch, dry matter, protein, and ash from those of another locality, and varie-

ties might differ in starch, dry matter, protein, and ash. A significant difference in dry matter, protein, and ash between years was also obtained. Irrigated potatoes were higher in starch and dry matter but lower in protein content than dry-land potatoes.

Effect of certain minor elements on chemical composition and cooking quality of potato tubers, O. SMITH and L. B. NASH. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 530–533*).—Smooth Rural potatoes were grown under conditions of complete nutrient solution, and the complete nutrient solution with low potassium and high nitrogen, with low potassium and low nitrogen, and minus copper, minus manganese, minus magnesium, minus boron, and minus iron.

Tubers from all treatments contained higher percentages of sucrose than those grown in complete nutrient cultures, the maximum being in tubers of the minus manganese and the low potassium, low nitrogen treatments. Treatments lowest in starch were the complete culture, same minus boron, and same minus iron. Other treatments were higher in starch percentage, the highest being the culture with low potassium. Cultures lowest in starch also had the highest percentages of total nitrogen. The culture low in potassium and nitrogen had the lowest total nitrogen. The narrowest ratio of protein (N×6.26) to starch was in the tubers grown in the complete culture and in the minus boron and minus iron cultures. Again, the highest ratio of protein: starch occurred in tubers grown with low potassium and nitrogen. No significant differences in starch content existed between complete nutrient solution and minus boron or minus iron. Omitting magnesium, manganese, and copper, and reducing the concentration of potassium and nitrogen in the cultures increased starch percentage.

Standard boiling tests revealed practically no differences in color, form, or texture in tubers from the several treatments. All were of an attractive white or cream color, retained their form without sloughing, and were moderately mealy. Tubers from complete nutrient and minus manganese cultures were judged as mild or very mild in flavor and were placed first in flavor. Tubers of the low potassium, low nitrogen treatment were fairly mild to mild, and those of low potassium, high nitrogen treatment sharp, bitter, or slightly strong. The poorest flavored potatoes came from cultures omitting iron, boron, or copper, and were judged as sharp, acid, metallic, bitter, very bitter, and strong. The order of preference of the tubers was complete nutrient culture, minus manganese, low potassium-low nitrogen, low potassium, minus iron, minus boron, and minus copper. None of the chemical analyses results were of value in explaining the flavor differences.

Tubers receiving boron as 20 lb. of borax per acre in the field were, when boiled, distinctly superior to those receiving no boron.

Row spacing and rate of seeding for rice nursery plats, N. E. JODON and H. M. BEACHELL. (U. S. D. A. and La. and Tex. Expt. Stas.). (*Jour. Amer. Soc. Agron., 30 (1938), No. 3, pp. 212–219*).—Increasing the number of rows per plat among nursery plats of about the same area, with a concomitant increase in the proportion of the plat harvested, increased the yields of rice and reduced the variability somewhat at Crowley, La., but had no significant effect at Beaumont, Tex. These differences were held due to greater uniformity and fertility of soil and to better stands at Beaumont. Varietal differences were significant at both stations and apparently were expressed equally over the full range of seeding rates and spacings.

Variations of the hydrocyanic acid content of Sudan grass from a single lot of seed, **C. F. ROGERS, A. H. LARSON, and M. L. SPRACHER.** **(Minn. Expt. Sta.).** (*Jour. Amer. Soc. Agron., 29 (1937), No. 10, pp. 865–876, figs. 3*).—The size and

seed color, HCN content, average length: width ratio for all leaves on each plant, and number of tillers are tabulated and discussed for plants of Sudan grass, studied in the field and later in the greenhouse.

Evaluation of sugar-beet types in certain sugar-beet-growing districts in the United States, A. W. Skuderna, F. R. Immer, C. E. Cormany, H. E. Brewbaker, C. A. Lavis, J. G. Lill, C. Price, J. O. Culbertson, and G. W. Deming. (Coop. Calif., Minn., Mich., and Colo. Expt. Stas. et al.). (*U. S. Dept. Agr. Circ. 476* (*1938*), *pp. 28, figs. 2*).—Intensive agronomic tests conducted 1930–33 with 9 brands of imported sugar beet seed representing tonnage, intermediate, and sugar types of beets were made in 13 locations in 8 States which represented a wide range in field conditions. In 10 of the 13 locations significant differential responses for acre yields of sugar were found. In general, the tonnage type varieties exceeded the intermediate and sugar type varieties in sugar per acre yields. "Sugar production by the sugar beet is, therefore, not only influenced by the factors of soil, moisture, and climate, and by the prevalence or absence of insect pests and diseases, but may also be affected to a considerable degree by the differential responses of sugar-beet brands to the wide range in altitude and latitude in the irrigated and humid areas where the crop is commercially grown."

Some sugar yield relationships, R. J. Borden (*Hawaii. Planters' Rec.* [*Hawaii. Sugar Planters' Sta.*], *42* (*1938*), *No. 2, pp. 125–128, figs. 4*).—The relations between the sugar yields of H 109 sugarcane and the crop of a field cycle, month of starting a crop, month of harvest, and age of the crop were determined from 10 yr. of field records. Unless field costs are concerned with decisions to plow out old ratoons, little seems to be gained by plowing and replanting H 109 except when the sugar-per-acre-per-month yields are falling below the normally expected values. Optimum sugar yields from H 109 cane under the climatic conditions of the Waialua district should be obtained from 24 months' cropping and when the fields are started and harvested between February and July.

The influence of potash on grade and shape of Triumph sweetpotatoes in Mississippi, W. S. Anderson. (Miss. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 34* (*1937*), *pp. 709–712*).—Increasing the potash content of the fertilizer from 4 to 16 percent in experiments, 1935–37, on three soil types at Laurel, Miss. (E. S. R., 78, p. 42), had no apparent effect on the proportions of the various grades nor on the shape of roots of Triumph sweetpotatoes.

The progressive storage of starch in roots of the Triumph sweetpotato during the growing season, W. S. Anderson. (Miss. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 34* (*1937*), *pp. 713–716, figs. 3*).—Studies on three soil types at Laurel, Miss., 1935–37, showed that the Triumph sweetpotato grown in southern Mississippi gradually builds up the proportion of starch in the roots during the growing season, which extends from the time roots are large enough to sample until early October or until photosynthesis is checked by discontinued plant growth.

Inducing the sweet potato to bloom and set seed, J. C. Miller. (La. Expt. Sta.). (*Jour. Heredity, 28* (*1937*), *No. 10, pp. 346–349, figs. 2*).—To bloom and set seed, sweetpotatoes evidently must be old enough to have accumulated carbohydrate reserves in the vines. They bloomed most freely with an 11.5-hr. day and set seed best with increasing day length from 11.5 to 12.5 hr. With decreasing photoperiod, as in the fall, plants of several strains had bloomed profusely in the field but thus far none had set seed. Each variety or group appeared to have definite conditions for blooming and setting seed.

Soil management and fertilization for tobacco, G. Roberts, E. J. Kinney, and J. F. Freeman (*Kentucky Sta. Bul. 379* (*1938*), *pp. 25–71*).—Experiments

in soil management, including rotations, and on uses of fertilizers in tobacco growing, 1917–36, were made at the station (E. S. R., 68, p. 297), at the Western Kentucky Substation, and on soil fields at Mayfield, Campbellsville, and Greenville. Recommendations incorporating the results may be summarized as follows:

The grower should select the best adapted, well-drained soil capable of producing at least 1,000 lb. of leaf per acre in average seasons without direct fertilization. Burley gives best results on land kept in pasture for several years. Badly depleted soil may need legumes plowed under or manure, or from 1 to 2 tons of lime and from 300 to 400 lb. of 20-percent superphosphate (or equivalent) per acre before seeding to pasture. Lime should be applied as far as possible, preferably from 3 to 4 yr., in advance of tobacco and reliming done only when needed by legumes in the rotation (E. S. R., 78, p. 330).

Bluegrass is ideal for land to remain in grass 3 yr. or longer, orchard grass for shorter periods, and redtop for dark tobacco. Timothy should not be used in tobacco rotations. Red clover and lespedeza seem to be the best legumes to seed with grass. The grass-legume mixture should be pastured, but if used for hay from 8 to 10 tons of manure should be applied when the land is broken for tobacco. Two successive tobacco crops, preferably with rye or other cover between, may be grown on land in sod for 3 or 4 yr.

For Burley on good sod land from 300 to 400 lb. of fertilizer applied at the row and containing from 4 to 5 percent nitrogen, from 8 to 12 percent phosphoric acid, and from 6 to 8 percent potash is indicated and from 500 to 800 lb. on less productive soils. Usually from 8 to 10 tons of manure per acre, supplemented by about 200 lb. of superphosphate at the row on soil low in phosphate, will give better quality tobacco than complete fertilizer. For dark tobacco on productive soils, from 200 to 300 lb. per acre of a 3–8–6 or similar fertilizer is recommended for use at the hills, to be supplemented on poorer soil by 200 lb. of superphosphate and from 50 to 75 lb. of potassium chloride or sulfate per acre broadcast. Limits are indicated for potassium chloride. Tobacco fertilized as recommended and failing to thrive in favorable weather may be stimulated by from 100 to 150 lb. of sodium nitrate or ammonium sulfate, side-dressed preferably when from 8 to 10 in. high.

The best placement of fertilizers for Burley is in continuous narrow bands on both sides of the row about 3 to 4 in. from the plants and 3 to 4 in. deep. The common method of mixing the fertilizers with the soil in making hills for dark tobacco suffices for small quantities of fertilizer, but larger amounts, where used, should be applied in bands as for Burley. Rows should be run across the slopes on land subject to washing, and in steep slopes sod strips from 10 to 15 ft. wide may be left at intervals to check water flow and reduce erosion.

Influence of air temperature and soil moisture subsequent to flowering on the nitrogen content of wheat, J. W. Hopkins (*Canad. Jour. Res., 16 (1938), No. 3, Sect. C, pp. 135–142*).—Marquis wheat plants were grown uniformly in soil in the greenhouse until flowering, when six differential treatments involving soil moisture and temperature were imposed. Effects of the higher air temperature (diurnal cycle of 55°–80° F. v. 45°–70°) in increasing the nitrogen content through accelerated respiration was evident in grain in the early dough stage (about 50 percent dry matter). By the late dough stage there were significant differences also attributable to soil moisture under both temperature regimes. The similarity of the nitrogen content of the mature grain for the six treatments was attributed to retardation of maturity by both increased soil moisture and lower temperature, which would permit additional dissipation

of carbohydrates through prolonged respiration, and also possibly to differences in tillering.

Convenient home germinator, H. R. Pettigrove (*Michigan Sta. Quart. Bul., 20 (1938), No. 4, pp. 229–233, figs. 4*).—The construction and operation of the "milk can germinator," a simple and economical device for the home testing of field crops and other seeds, are described and illustrated.

The control of dandelions in lawns, W. E. Loomis. (Iowa Expt. Sta.). (*Jour. Agr. Res. [U. S.], 56 (1938), No. 12, pp. 855–868, figs. 4*).—Straight-run kerosene (E. S. R., 76, p. 37) with a boiling point range of from 180° to 250° C. and an unsaturated hydrocarbon content of not over 4 percent was shown to be very effective as a differential spray for dandelions (*Taraxacum officinale*) in bluegrass-white clover lawns. Undiluted kerosene is sprayed uniformly over the lawn during cool, cloudy weather at the rate of 200 gal. an acre. Best results were obtained by spraying 2 mo. before the end of the bluegrass growing season, or September 15 to 30 at Ames, Iowa. The kerosene appeared to accumulate and to be retained in the taproot of the dandelion and to affect the plant through the destruction of the phloem of the root. Other common lawn plants and weeds showed little or no injury from applications of kerosene effective against dandelion. Scattered dandelion plants might be eradicated at any time by spraying the individual plants lightly with kerosene. Precautions for the use of kerosene and other hydrocarbons on bluegrass lawns and suggestions on care of treated lawns are also included.

The food reserves of the common dandelion were shown to consist largely of a mixture of levulin and dextrin and to have reached a low level for the samples tested during early spring growth.

HORTICULTURE

[Horticultural studies by the Indiana Station]. (Partly coop. U. S. D. A.). (*Indiana Sta. Rpt. 1937, pp. 8, 9, 10, 66–71, figs. 4*).—Among the studies the progress of which is discussed are effect of cultural treatments on growth and reproduction in the apple, by J. T. Sullivan and C. E. Baker; chemical basis of quality of inbred lines of sweet corn, by Sullivan and J. R. Roach; removal of spray residues, by O. W. Ford and C. L. Burkholder; apple storage, by Baker; apple pruning and apple spraying, both by Burkholder; tomato seed production, by E. C. Stair; production of vegetables on sandy soils, by J. D. Hartman and F. C. Gaylord; production of vegetables and small fruits on muck soils, by N. K. Ellis and Gaylord; marketing of fruits, vegetables, and flowers, by Gaylord and K. I. Fawcett; selection of asters for resistance to wilt, and manurial substitutes for greenhouse roses, both by E. R. Honeywell; and effect of quantity and quality of light on greenhouse plants, by R. B. Withrow and J. P. Biebel.

[Horticultural studies by the Ohio Station] (*Ohio Sta. Bul. 592 (1938), pp. 54–66, 57, 59, 60–62, 64–71, 72–75, 76*).—Included are progress statements on the following studies: Cytology of the apple flower, by F. S. Howlett; new varieties of fruits, by Howlett, J. H. Gourley, C. W. Ellenwood, and L. Havis; relation of soil moisture to tree and fruit growth, by Howlett and [R.] Bradfield; mulch production in orchards, by Gourley and I. P. Lewis; effect of organic matter on strawberry plants, by Havis; spacing of apple trees, by Ellenwood; storage of fruit, by D. Comin; inheritance of uniform ripening character in the tomato, by H. D. Brown and [J. A.] Campbell; production of tomato plants in cinders and nutrient solutions and with the use of hormodin, by Brown and Todd; iodine content of lettuce, by Brown and Dietz; vegetable variety tests, by Brown, O. N. Riley, and [E. M.] Rahn; effect

of various factors on minerals and vitamins in tomatoes, by I. C. Hoffman, [W. E.] Krauss, and [R. G.] Washburn; effect of excessive applications of chemical fertilizers on the tomato, and the effect of treating tomato plants with supplemental light on the set of early fruit, both by Hoffman; anatomical and chemical observations on flower-bud differentiation in the chrysanthemum, by [C. B.] Link; control of chlorosis in the pin oak, effect of pH and minor elements on the production of outdoor roses, and effect of growth-promoting substances on transplants, all by A. Laurie and L. C. Chadwick; production of asters as a spring crop, by [G. H.] Poesch; the effect of phosphorus on stem length of lilies, by Laurie; use of chemicals to promote rooting of cuttings, and supplemental light for gardenias, both by Poesch; growing of asters and chrysanthemums under cloth, by Link; storage of cut flowers, by Laurie; and sterilization of sweet pea soil, by Laurie and [R. H.] Simon.

[**Horticulture at the Puerto Rico Station**], J. GUISCAFRÉ ARRILLAGA, J. SIMONS, E. MOLINARY SALÉS, F. MÉNDEZ, A. ROQUE, and A. RIOLLANO (*Puerto Rico Col. Sta. Rpt. 1937, pp. 25–40, 43–55, 59, 60, 65, 66, 67, 115–117, 153, 154–158, 161, 162, 165–167*).—Among studies reported are fertilizer, propagation, shading, root growth, pruning, liming, varietal, and fruit-setting tests with coffee; propagation and fertilization of citrus; propagation and varieties of mangoes and avocados; general plant introduction; varieties and fertilizers for bananas and plantains; fertilizers and varieties of garden peas; growth of dwarf coconuts; breeding of bacterial-wilt-resistant eggplant and of downy-mildew-resistant cucumbers; variety fertilizer, and culture tests with miscellaneous vegetables; and growing of tung-oil trees.

[**Horticultural studies by the Wisconsin Station**], L. LANGFORD, R. H. ROBERTS, J. G. MOORE, O. B. COMBS, N. P. NEAL, E. J. DELWICHE, and F. L. MUSBACH (*Wisconsin Sta. Bul. 440 (1938), pp. 32, 33, 35–37, 72–74, 76–80, 87, fig. 1*).—Included are progress statements concerning studies of orchard soil management, causes of biennial production in the McIntosh apple, yield of small fruits, varieties of bush beans, improvement of eggplant varieties, breeding of the tomato, production of hybrid sweet corns, testing of canning pea varieties, and fertilizers for canning peas and cranberries.

Progress in horticultural science, A. J. HEINICKE (*Science, 87 (1938), No. 2259, pp. 333–337*).—This is the presidential address delivered at the meeting of the American Society for Horticultural Science on December 29, 1937.

Phosphate placement in growing of horticultural crops, V. E. IVERSON. (Mont. Expt. Sta.). (*Northwest Assoc. Hort., Ent., and Plant Path., Corvallis, Oreg., 3 (1937), Abs. Papers, p. 3*).—Placement in bands at the side of the row of 400 lb. of superphosphate per acre was almost without exception superior to placement of a single band under the row. The superphosphate had a decidedly stimulating influence on root growth.

A look into the seed bag, M. T. MUNN (*Farm Res. [New York State Sta.], 4 (1938), No. 3, p. 9, fig. 1*).—The author discusses quality in flower, vegetable, and grass seed as revealed in laboratory and field trials at the station.

Sand culture for seedlings, A. A. DUNLAP. (Conn. [New Haven] Expt. Sta.). (*Florists Exch. and Hort. Trade World, 90 (1938), No. 12, p. 21, figs. 2*).—A method of raising seedlings in sand culture is described. The following advantages are set forth: Excellent germination; freedom from damping-off; production of strong plants with sturdy root systems; and control of the rate of growth.

The effect of location of the hotbed heating cable upon the physiological development of vegetable seedlings and resulting crops, E. F. BURK and A. N. COLBY. (Wash. Expt. Sta.). (*Northwest Assoc. Hort., Ent., and Plant

Path., Corvallis, Oreg., 3 (1937), Abs. Papers, pp. 4, 5).—The placing of heating cables on the surface between each pair of seedling rows resulted in the earliest germination and most rapid growth. Air temperatures were approximately 10° higher, and soil temperatures 1 in. below the surface were approximately 3° lower, where the cable was on the surface or 2 in. above than where it was buried either 4 or 11 in. deep.

Results of planting vegetables on old orchard land, G. W. WOODBURY. (Idaho Expt. Sta.). *(Northwest Assoc. Hort., Ent., and Plant Path., Corvallis, Oreg., 3 (1937), Abs. Papers, p. 17).*—Vegetables grown on land recently reclaimed from an old orchard made distinctly poorer growth where the rows passed over the sites of the former trees. Onions were affected more adversely than the other species tested. Poor physical conditions of the soil, the depletion of nutrients, or accumulated soluble arsenic are among the possible causes. Where soil was taken into the greenhouse and snap beans were grown in it, growth was better in soil taken from between the old trees, with one exception—where ammonium sulfate was used.

Boron deficiency in cauliflower, W. FERGUSON *(Sci. Agr., 18 (1938), No. 7, pp. 388–391, figs. 2).*—From studies at the Central Experimental Farm, Ottawa, Ont., the author reports that boron is essential to the normal, healthy growth of cauliflower. Insufficient boron caused stunting and deformation of the leaves surrounding the curd, reduced the size of the curd, and caused browning. Brownish, water-soaked areas appeared in the flesh and stalks. A concentration of 0.25 p. p. m. of boron in the nutrient solution supplied to plants in sand resulted in normal development.

Lettuce growing in North Carolina, R. SCHMIDT *(North Carolina Sta. Bul. 319 (1938), pp. 12, figs. 7).*—Information of a general nature is presented relative to culture, fertilization, marketing, control of insects, and diseases.

Wisconsin pea canning trials, E. J. DELWICHE. (Wis. Expt. Sta.). *(Canner, 86 (1938), No. 12, pt. 2, pp. 75, 76).*—Tests in 1937 on 20 varieties of peas all planted at the same time showed the midseason varieties to produce the largest yields and, on the whole, the highest quality peas. Of these, Early Wales, Gradah, Pride, and Wisconsin Penin produced the largest proportion of the larger sieve size. Early Sweet types did fully as well as Alaska and are said to be capable of replacing a considerable share of the Alaska types under Wisconsin conditions.

Factors in the production of early tomatoes, A. M. PORTER. ([Conn.] Storrs Expt. Sta.). *(Veg. Growers Assoc. Amer. Ann. Rpt., 1936, pp. 86–91).*—Liberal applications of acid phosphate increased the amount matured by several varieties of tomatoes in the early season. Comparing hardened tomato plants with tender, the results favored the tender plants, particularly in the quality of fruit.

Effect of date of planting on tomato yields and quality, H. C. STIER. (Md. Expt. Sta.). *(Canner, 86 (1938), No. 16, pp. 14, 16, 18).*—Results of 1937 trials in which Marglobe plants were set in the field on May 8 and 21, June 7 and 20, and July 15 showed no significant difference in total yield between the two May plantings, with both outyielding any of the others. The May 21 plants developed the larger leaves, a greater number of clusters, and a higher percentage of No. 1 fruits. Defoliation began in from 65 to 80 days after setting in all lots.

Why New York grows such a wide range of tomato varieties, W. T. TAPLEY *(Farm Res. (New York State Sta.], 4 (1938), No. 3, p. 2, fig. 1).*—Observations are presented on a number of old and new tomato varieties, with special comments as to their specific uses.

Preliminary tests with plant hormones in the rooting of greenwood cuttings, R. W. OLIVER *(Sci. Agr., 18 (1938), No. 7, pp. 379–387, figs. 4).*—At

the Central Experimental Farm, Ottawa, Ont., a number of proprietary and locally prepared root-promoting substances were tested on a number of ornamental and fruit species. As a result, an optimum concentration is suggested for certain plants, such as lilac, hydrangea, forsythia, rose, yew, and arborvitae. The two apples used did not respond readily to treatment. It was evident that the optimum treatment is influenced by light, temperature, relative humidity, ripeness of the wood, and the pH of the medium in which planted.

Pruning the tree fruits, W. H. UPSHALL (*Ontario Dept. Agr. Bul. 392 (1938), pp. 23, figs. 16*).—This is a discussion of the principles and practices.

Dwarf fruit trees are attracting much attention, H. B. TUKEY (*Farm Res. [New York State Sta.], 4 (1938), No. 3, pp. 10, 11*).—In this general discussion progress is recorded on the development of stocks for dwarfing apple trees, with particular emphasis on semistandard forms.

The fruit tree situation in Utah, A. L. WILSON and A. L. STARK (*Utah Sta. Bul. 279 (1938), pp. 30, figs. 12*).—Based on a farm-to-farm survey of the 10 leading fruit-growing counties of the State, it was observed that in most counties the production of peaches, cherries, and apricots was increasing, while that of plums, prunes, and apples was decreasing. One-third of the apples, one-fifth of the sweet cherries, one-tenth of the apricots, one-seventh of the pears, one-tenth of the sour cherries, and one-sixth of the plums and prunes were found unproductive and unprofitable. This represented a total of about one-fifth of the fruit-tree population in the 10 counties. Utah County, with 43.3 percent of the fruit trees in the State, was by far the most important county.

Results in resetting old apple orchard land with fruit trees, L. VERNER. (Idaho Expt. Sta.). (*Northwest Assoc. Hort., Ent., and Plant Path., Corvallis, Oreg., 3 (1937), Abs. Papers, pp. 2, 3*).—Following the removal of an orchard of 22-year-old apple trees, young apple, peach, sweet cherry, apricot, and prune trees were set in the old holes and in the center of the old squares. In addition, another group, set in the old sites, were fertilized with stable manure. At the end of the first season, the results favored the trees set in the center of the squares. Manure was helpful. As to species, the apple and sweet cherry trees were most adversely affected by the old soil, with some of the others showing little or no reaction. Analyses of the soil showed 7 p. p. m. of soluble arsenic as arsenic trioxide in the old spots, with only a trace in the centers. Whether or not arsenic was the primary harmful agent was not established.

Malling stocks and French crab seedlings as stock for five varieties of apples, II, W. H. UPSHALL (*Sci. Agr., 18 (1938), No. 7, pp. 370–378, figs. 10*).—This is a further report (E. S. R., 73, p. 476) upon rootstock investigations at the Horticultural Experiment Station, Vineland, Ont., in which five apple varieties, Rhode Island Greening, Melba, Delicious, Northern Spy, and McIntosh, are growing on French crab and Malling I, II, and XVI roots. In three of the varieties French crab produced the largest trees, and in the other two Malling XVI. Except in the case of Melba, Malling II trees led in fruit production on a per-tree basis. There was a suggestion that Malling XVI trees produced McIntosh fruits of a superior color. There was no significant difference among the four stocks with reference to size of fruits. Trees on Malling I appeared to suffer most from potassium deficiency. Clonal stocks did not appear to reduce variability in tree size, but did promote uniformity in production to a slight degree.

Early fruit thinning in relation to annual bearing, F. S. HOWLETT and T. F. FOWLER (*Ohio Sta. Bimo. Bul. 192 (1938), pp. 99–110*).—When fruits of halves of the same trees of Delicious, Northern Spy, Oldenburg, and Stayman Winesap were thinned approximately 3 weeks after petal fall and from 6 to 7 weeks after petal fall, in all cases the early thinning resulted in the

production of sufficient flowers the subsequent year to yield a commercial crop. On the other hand, the later thinning was associated with a very marked reduction in fruiting the following year. The authors point out the commercial limitations to early thinning and present practical suggestions for growers.

Red Gravenstein: New apple variety recommended for trial planting in Michigan, W. Toenjes (*Michigan Sta. Quart. Bul., 20 (1938), No. 4, pp. 228, 229*).—Brief descriptive and commentary notes are offered.

Chemical study of the ripening process of Bosc pears, W. E. Martin (*Bot. Gaz., 99 (1937), No. 1, pp. 42–68, figs. 5*).—Oregon-grown Bosc pears picked September 3, 13, and 23 from a single tree, with the middle date representing the commercial harvest, were stored until November 16 at from 30° to 31° F. and then shipped to the University of Chicago for analysis. Samples of the three picking groups were taken at daily intervals from the ripening room at 67°. The principal difference in the sugar content of the fruit of the three harvests lay in the amount of sucrose, which was least in the early picked and highest in the late-picked fruit. Levulose increased during the entire ripening period, whereas sucrose increased for from 6 to 8 days and then declined. Dextrose remained constant during the formation of sucrose, but increased as the sucrose disappeared. Sorbitol, identified as a constituent of the Bosc pear, was observed to decrease during the ripening process in sufficient amounts to account for the observed increases in total sugars.

The effects of partial sterility on fruit and cane development of blackberry and dewberry varieties, H. F. Morris. (Tex. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 34 (1937), pp. 492–494*).—A record is presented of the occurrence of imperfect fruits in the Lawton blackberry and other varieties. The normal Lawton berry had an average of 73 achenes, compared with only 6.2 in the defective. No connection could be established between fertilizer or pruning treatment and the abnormality, and virus infection is suggested as the most probable explanation pending the outcome of inoculation and spraying studies.

Progress report on strawberry tests at Baguio, Mountain Province, M. E. Gutierrez (*Philippine Jour. Agr., 8 (1937), No. 4, pp. 391–416*).—The Hood River and Wilson varieties were found the best for the region, but some promising results were obtained in selecting seedling varieties from Wilson, Missionary, Mastodon, Bellmar, Big Joe, and Fairfax. Pine needle mulch proved helpful when scattered on the soil, but when incorporated in the soil proved detrimental. Plants grown in the nursery proved more productive than those taken from old beds.

The grape in Ontario, E. F. Palmer and J. R. Van Haarlem (*Ontario Dept. Agr. Bul. 391 (1938), pp. 39, figs. 15*).—General information is presented on site selection, varieties and their uses, pruning, culture, etc.

Grape pomace as a vineyard and orchard fertilizer, R. E. Jacob and E. L. Proebsting. (Univ. Calif.). (*Wines and Vines, 18 (1937), No. 10, pp. 22, 23*).—As a result of their studies, the authors conclude that grape pomace as a vineyard and orchard fertilizer compares favorably in chemical composition with manure but is slower acting. The addition of lime to the pomace did not enhance its value on ordinary soils that are not deficient in lime. No particular harm is likely to result from moderate applications of freshly placed pomace to vineyard or orchard soils.

The absorption of selenium by citrus and by grapes, W. M. Hoskins (*Science, 87 (1938), No. 2246, pp. 46, 47*).—As a result of analyses of citrus fruits and grapes harvested from plats which had been sprayed for several years with a commercial product containing selenium, the author suggests

that although the fruits from the sprayed plats contained a somewhat higher concentration of selenium than those from the control areas, neither citrus nor grapes concentrate large amounts of selenium in their fruit as a result of spraying for the control of red spider with selenium dissolved in a potassium-ammonium-sulfide solution.

Maturity studies of Marsh Seedless grapefruit in the Lower Rio Grande Valley, J. F. Wood and H. M. Reed (*Texas Sta. Bul. 562 (1938), pp. 39, figs. 13*).—Among factors found to influence composition of the fruits were the position of the fruit on the tree, amount of irrigation, and time of harvest. Total soluble-solids content, as determined in degrees Brix, and the solids-to-acid ratio used in conjunction with volume-of-juice requirements were found the most practical and efficient measures of grapefruit maturity. The quantity of amino acid was erratic and showed no definite seasonal trend. Human taste was subject to too great error to be a good index to maturity. The composition of the juice was not uniform throughout the fruit. Maturity was influenced by fertilizer treatment and the age of the trees. Fruit of the older trees averaged less rind, more rag, less juice, and lower specific gravity. As maturity advanced, citric acid decreased and the ratio of solids to acid increased. Invert sugars and total sugars increased, while sucrose remained almost constant. The ratios of invert sugar to acid, sucrose to acid, and total sugars to acid showed general upward seasonal trends. The pH values advanced slightly with the season, but the trend was not as definite as some other changes.

Periodicity in the growth of the orange tree, H. S. Reed and D. T. MacDougal. (Calif. Expt. Sta.). (*Growth, 1 (1937), No. 4, pp. 371–373, fig. 1*).—Observations at Riverside, Calif., on irrigated Washington Navel oranges budded on sweet orange roots showed three distinct cycles of radial growth starting in early April, early July, and early August, respectively. The cycles of shoot elongation and cambial growth showed a strong tendency to alternate, with the shoot elongatiou coming first. There were but two distinct cycles of root elongation from March 1 to October 1, the first coinciding rather closely with the first cycle of cambial activity, and the secoud approximately synchronous with the second and third cycles of cambial activity. Discontinuous shoot growth extended over a period of approximately 8 mo., cambium growth 5 mo., and root elongation about 3 mo. The cyclic growth of roots appeared to be influenced by temperature and hormonic communication between roots and shoots.

Girdling to induce bearing in the Fuerte avocado, R. W. Hodgson and S. H. Cameron (*Calif. Avocado Assoc. Yearbook, 1937, pp. 149–153*).—Girdling during approximately the first half of the blossoming period of certain branches on a tree greatly increased their yield as compared with adjacent untreated branches. On the other hand, girdling during the latter half of the blooming period had no beneficial effects. In subsequent studies the most effective period for girdling was just prior to initiation of blooming. In the following year, without further treatment, the girdled limbs produced slightly less fruit than the nongirdled. Regirdling of limbs the next season had a beneficial influence on yield but not to the extent of the initial treatment. The majority of the girdling wounds healed over in from 6 weeks to 2 mo. The authors point out that the yields even on girdled limbs were not such as to suggest that girdling is the solution of the problem of low-producing orchards. Mean temperatnre during the blooming and fruit-setting period is considered an important factor.

Studies of the root system of Coffea arabica L.—I, Environmental condition affecting the distribution of coffee roots in Coloso clay, J. Guiscafré Arrillaga and L. A. Gómez (*Jour. Agr. Univ. Puerto Rico* [*Col. Sta.*], *22 (1938), No. 2, pp. 227–262, pl. 1, figs. 12*).—In a study of the root systems of six 7-year-old

trees there were found 94 percent of the roots in the top foot of soil and 99 percent in the upper 2-ft. zone. The vertical penetration was 3 ft. and the lateral extension 4 ft. Organic matter was especially abundant in the upper foot, and no fixed ratio was apparent between tops and roots, although in general it approximated 8:1. A heavy and vigorous coffee tree top was apparently not dependent on an extensive root system. Moisture percentages were 50, 23, 39, and 50, respectively, in the upright stems, lateral branches and leaves, whole tops, and in the roots.

Further study of the influence of heat and carbon dioxide on the development of Carabao mango buds, F. G. GALANG and J. A. AGATI (*Philippine Jour. Agr., 8 (1937), No. 4, pp. 379–389, figs. 2*).—Continuing investigations (E. S. R., 78, p. 487), grafted Carabao mango trees from 3.5 to 4 yr. of age were, in one case, treated with carbon dioxide and, in the other, with heat. Of the seven trees treated with carbon dioxide, six developed new buds. The averages of new buds for the carbon dioxide, heat, and control lots were 68.4, 20, and 27.3 percent, respectively. In the carbon dioxide lot the development of new buds took place in from 23 to 70 days, representing a total of from about 157 to 401 hr. of carbon dioxide treatment. The average air temperatures in the carbon dioxide, heated, and control chambers were 31.08° C. (87.9° F.), 33.98°, and 30°, respectively.

Landscaping the farmstead, W. A. ROSS and L. L. SCRANTON (*U. S. Dept. Int., Off. Ed., Vocat. Ed. Bul. 189 (1938), pp. VI+88, figs. 27*).—This contains general information on plant materials, planting plans, culture, etc.

Ornamental plantings on station grounds.—II, The vines, G. P. VAN ESELTINE (*Farm Res. [New York State Sta.], 4 (1938), No. 3, pp. 8, 11, fig. 1*).—Notes are presented on numerous climbing and trailing ornamental plants used for decorating the station grounds (E. S. R., 78, p. 635).

Famous trees, C. E. RANDALL and D. P. EDGERTON (*U. S. Dept. Agr., Misc. Pub. 295 (1938), pp. 116, figs. 51*).—This pamphlet is devoted to historical, descriptive, and other pertinent comments on trees associated with notable persons, events, and places.

FORESTRY

[Forestry studies by the Indiana Station] (*Indiana Sta. Rpt. 1937, pp. 57, 58, 59–62, fig. 1*).—Investigations discussed are marketing of basket veneer and handle stock, by R. C. Brundage; and woodlot management, influence of windbreaks on air and soil temperatures, air movement and soil moisture, species for windbreak plantings, and management of forest nurseries, all by D. DenUyl.

[Forestry studies by the Ohio Station], O. A. ALDERMAN, R. R. PATON, and B. E. LEETE (*Ohio Sta. Bul. 592 (1938), pp. 127–129, 130–134, figs. 3*).—This is a general statement on management of the State forests, reforestation activities, and the control of fires.

Ohio Forest News, [July 1938] (*Ohio Forest News [Ohio Sta.], No. 34 (1938), pp. 12, pl. 1, figs. 9*).—This pamphlet contains general information with regard to the Mohican State Forest, pointing out its geological and other features that contribute to its value as a recreational center.

[Forestry research by the Wisconsin Station], S. A. WILDE and H. M. GALLOWAY (*Wisconsin Sta. Bul. 440 (1938), pp. 90, 91, fig. 1*).—The studies included refer to the effect of humus and the use of alkaline peat and green manuring on the production of sturdy nursery trees.

Farm forestry for Virginians, W. O'BYRNE and J. B. GRANTHAM (*Va. Polytech. Inst. Bul., 31 (1938), No. 5, pp. 63, figs. 19*).—This contains general information as to planting, care, measurement, marketing, etc.

Forest trees of the Pacific Coast, W. A. Eliot (*New York: G. P. Putnam's Sons, 1938, pp. 565, figs. [249]*).—General information is presented with reference to distribution, growth, characteristics, and utilization of a large number of species.

American western pines and their uses, W. L. Neubrech (*U. S. Dept. Com., Bur. Foreign and Dom. Com., Trade Prom. Ser. 180 (1938), pp. 34, figs. 28*).—Information is presented on the distribution, supply, characteristics, and utilization of three western pines, Idaho white, ponderosa, and sugar.

***Red pine in Connecticut forest plantations.*—I, Volume tables for red pine, Pinus resinosa, Solander,** H. W. Hicock and R. Kienholz (*Connecticut [New Haven] Sta. Bul. 413 (1938), pp. 561–570, figs. 3*).—This presents an alignment chart and volume tables based on data taken during the thinning of 22 permanent plats in 1930 and 1936. The total age of the trees from seed ranged from 16 to 32 yr. The plantations were established as pure stands on open-field sites.

DISEASES OF PLANTS

The Plant Disease Reporter, July 15, August 1, and August 15, 1938 (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 22 (1938), Nos. 13, pp. 259–279, figs. 5; 14, pp. 281–303, figs. 2; 15, pp. 305–339, figs. 6*).—The following items are included:

No. 13.—A survey of cotton seedling diseases and the fungi associated with them (with special reference to damping-off and its control), by P. R. Miller; the fungus flora of the Peavy Aboretum, Oreg., by G. R. Hoerner; X-virus disease on peaches in New York, by E. M. Hildebrand and D. H. Palmiter; *Phytophthora cactorum* (?) rot of apple fruit, by H. W. Anderson; strawberry dwarf (*Aphelenchoides fragariae*) situation on Cape Cod, by O. C. Boyd; a disease resembling fire-blight on black raspberry in Pennsylvania, by G. L. Zundel; *Bacterium cerasi* gummosis on sweet cherry in New York, by D. H. Palmiter; losses caused by potato diseases in the Hastings section, Florida, in 1938, by A. H. Eddins; a new biologic form of powdery mildew (*Erysiphe cichoracearum*) on muskmelons in the Imperial Valley of California, by I. C. Jagger, T. W. Whitaker, and D. R. Porter; downy mildew and other diseases of onion in New York, by A. G. Newhall; and notes on potato late blight, and bacterial wilt of sweet corn in New York.

No. 14.—Observations on willow blight (*Fusicladium saliciperdum*) in Maine, 1927 to 1938, by F. H. Steinmetz and A. E. Prince; notes on some tree diseases in Georgia, by G. E. Thompson; possible damage caused by stem rust of wheat in 1938 (general summary, with map); ergot on barley in Illinois, by G. H. Boewe; oat anthracnose (*Colletotrichum graminicolum*) in Arkansas in 1938, by H. R. Rosen; fireblight on apple in North Carolina, by H. R. Niswonger; "blue mold of tobacco in Canada," by L. W. Koch; control of tobacco downy mildew in Georgia, 1938, a condition resembling ruffle leaf of tobacco reported in Georgia, and tobacco diseases in Georgia, all by S. B. Fenne; the weather and the plant disease situation in Massachusetts, 1938, by O. C. Boyd; plant diseases reported from New York, 1938; *Sclerotinia sclerotiorum* on ornamentals in Missouri, by J. T. Middleton; and brief notes on plant diseases, including wheat diseases and *Helminthosporium* blight on corn in Virginia, *Dothichloë nigricans* on *Panicum scribnerianum* in Nebraska, potato rot and "blight" in various States, bacterial spot (*Phytomonas vesicatorium*) of tomato in Nebraska, and some diseases of ornamental trees in Oregon.

No. 15.—Extension of range of the Dutch elm disease and its known distribution in this country; history of chestnut blight in Illinois, by H. W. Anderson; cotton root rot in Texas in 1937 and conditions affecting its local prevalence,

by W. N. Ezekiel (Tex. Expt. Sta.); outbreak of ***Ascochyta gossypii*** blight on cotton in South Carolina, by G. M. Armstrong; unusual prevalence of bacterial leaf spots of tobacco in Massachusetts (angular leaf spot and wildfire), Pennsylvania (wildfire), and Kentucky (wildfire and angular leaf spot or blackfire); *Fusarium* wilt on tobacco in Piedmont South Carolina, by G. M. Armstrong; downy mildew (*Peronospora tabacina*) of tobacco in Massachusetts; diseases of mint in Indiana; psyllid yellows in central and eastern Nebraska, by R. W. Goss; reports on late blight of potato in Massachusetts, New York, Pennsylvania, and Virginia; potato diseases in Nebraska and certified fields last year, by R. W. Goss; diseases of canning tomatoes in Indiana and the relation to source of transplants, by H. R. Thomas and R. W. Samson; reports on bean rust on Long Island and in eastern Virginia, and anthracnose severity in Massachusetts; diseases of cucurbits in Massachusetts, New York, and South Carolina; celery diseases reported from Massachusetts, New York, and eastern Virginia; reports on potato diseases in Massachusetts, tomato leafmold destructive in a garden in South Carolina, late blight on tomato in New York, onion diseases in Massachusetts, *Cercospora* blight on carrots in Massachusetts, and eggplant wilt on Long Island; X disease of peach found in Massachusetts, by O. C. Boyd; leaf scorch on apple foliage in New York, by M. B. Hoffman; fruit diseases reported from Indiana, by R. C. Baines; further estimates on probable stem rust damage this year; wheat diseases reported from South Carolina, by G. M. Armstrong; and brief notes on diseases of sweet corn in New York, corn rust in Georgia, leaf spot (*Pseudopeziza medicaginis*) of alfalfa in Massachusetts, and a leaf spot (cause unidentified) of marigold in Massachusetts.

[Plant disease work in Indiana]. (Partly coop. U. S. D. A.). (*Indiana Sta. Rpt. 1937, pp. 9, 34–38, 39, figs. 2*).—Brief notes are included on studies of the effect of *Puccinia triticina* leaf rust on the yield, composition, and quality of wheat, by J. T. Sullivan and H. R. Kraybill; timing of apple scab sprays by spore maturity studies, the seriousness of mint anthracnose (*Sphaceloma menthae*) in the State, and *Phytophthora cactorum* trunk canker of apple trees, all by R. C. Baines; ridding tomato seed of disease organisms, by R. W. Samosh and T. J. Nugent; wheat varieties resistant to black stem rust, and the spread and control of wheat mosaic, both by R. M. Caldwell and L. E. Compton; bacterial wilt resistance in hybrid sweet corn, by G. M. Smith; ear and stalk rots of dent corn, by J. F. Trost; and studies of the rust genus *Prospodium*, parasitic on plants of the trumpetcreeper and verbena groups, by G. B. Cummins.

[Plant disease work in Ohio]. (Partly coop. U. S. D. A.). (*Ohio Sta. Bul. 592 (1938), pp. 29, 30, 34–37, 38, 39, 40, 134, 135*).—Brief records of progress are included on work with bacterial wilt of alfalfa in Ohio, by C. J. Willard; apple tree measles, apple scab development and control, cherry leaf spot control, control of scab and brown rot of peach, and steam-vapor spraying for control of peach leaf curl, cherry leaf spot, and apple scab, all by H. C. Young and H. F. Winter; potato spray tests, by P. E. Tilford; comparison of low-solubility copper compounds as vegetable sprays, by J. D. Wilson and H. A. Runnels; susceptibility of celery to *Fusarium apii*, by Wilson; toxicity of low-solubility copper compounds as tested on glass slides, by Runnels and Wilson; tree wound dressings, by Tilford and Young; damping-off of pine seedlings, and pine spraying experiments for the control of needle blight (*Septoria ?*), both by Tilford; Globelle—the new leaf mold-resistant tomato variety, by L. J. Alexander; and white-pine blister rust control work (1933–37), by [O. J.] Dowd.

Annual report of the division of plant pathology 1936–1937, M. T. Cook (*Puerto Rico Col. Sta. Rpt. 1937, pp. 103–111*).—This includes observations and progress reports on climatic conditions; sugarcane gummosis, dry top rot,

root disease, and leaf spot; diseases of bananas and plantains; diseases of coconuts and other palms; pineapple diseases; citrus anthracnose; coffee diseases; and records of the important diseases of the year by host plants.

Plant diseases (*Wisconsin Sta. Bul. 440 (1938), pp. 40–57, figs. 9*).—Reports of progress are given on sulfur applications to potato land for scab control, by J. C. Walker, R. H. Larson, and A. R. Albert; potato spray program for southeastern Wisconsin, by O. C. Whipple and T. C. Allen; yellow dwarf potato losses in 1937, by Larson and Walker; potato "sprain" appearing in the State, by Walker, Larson, and Albert; new wilt disease (*Fusarium avenaceum*) of potato, by J. G. McLean and Walker; tomato disease control (by spraying and breeding), including bacterial canker studies, by Whipple, V. Wright, and Walker; cabbage black rot, mosaic, club root, and yellows troublesome in 1937 (coop. U. S. D. A.), and boron in prevention of black spot of beets, both by Walker; nonimmunity of canning pea varieties to near-wilt, by W. J. Virgin and Walker; better control methods for apple scab (including lime-sulfur program modifications, by G. W. Keitt, C. N. Clayton, and J. B. Carpenter; eradicant fungicides, by Keitt and M. H. Langford; and breeding trials with the scab fungus, by Keitt, Langford, and D. H. Palmiter); bordeaux substitutes resulting in larger cherry size in 1937, by Keitt and Clayton; forest tree disease studies, by A. J. Riker et al. (coop. U. S. D. A. et al.), including work on farm wood lots, forestry nursery problems, forest plantings, and tree improvement; and crown gall studies casting light on the mechanism of abnormal cell stimulation (growth substance in crown gall, and cell stimulation by chemicals), by J. Van Lanen, Riker, I. L. Baldwin, S. B. Locke, B. M. Duggar, and R. Nagy.

Evaluation of some sulfur fungicides, H. W. ANDERSON and K. J. KADOW. (Univ. Ill.). (*Ill. State Hort. Soc. Trans., 71 (1937), pp. 245–255, pl. 1*).—The season's tests are believed to have demonstrated that any type of sulfur ordinarily used as liquid or dust can be depended on to control apple scab if sufficient applications are given during the infection period. In comparing a number of types and combinations, flotation sulfur and apparently "Mike" sulfur, used alone, gave satisfactory control under rather severe test conditions, whereas homemade wettable sulfur and Kolofog failed to do so. Lime-sulfur combined with all types of wettable sulfur proved satisfactory.

Soil conditions and the root-infecting fungi, S. D. GARRETT (*Biol. Rev. Cambridge Phil. Soc., 13 (1938), No. 2, pp. 159–185*).—This is a review of papers published during the past 15 yr. (with a bibliography of about 3½ pages) on soil-borne fungus diseases of plants, with special reference to the influence of soil conditions on infection.

Tiny toadstools on crop plants in Illinois, G. H. BOEWE (*Ill. State Acad. Sci. Trans., 30 (1937), No. 2, pp. 103, 104, figs. 3*).—This reports *Marasmius tritici* attacking small grains and grasses, *M. pyrinus* on pear and apple, *Marasmius* sp. on apple, and *Naucoria* on small grains.

Observations on the dissemination of fungi by ants, J. G. LEACH and L. DOSDALL. (Univ. Minn.). (*Phytopathology, 28 (1938), No. 6, pp. 444–446, fig. 1*).—Spores of several fungi, principally *Alternaria*, were found in the infrabuccal pellets of ants (*Formica fusca subsericea*) removed from peony buds and germinated in water. Bud blight on the plants studied, however, seemed to be of nonpathogenic origin. Petals in the necrotic early stages were sterile, and the fungi isolated from the later stages (*Alternaria*, and an unidentified hyphomycete caused no infection. Furthermore, plants protected from ants also produced blighted buds.

Incidence of air-borne fungus spores.—I, Alternaria, O. C. DURHAM (*Jour. Allergy, 8 (1937), No. 5, pp. 480–490, figs. 6*).—Adapting the current methods of

studying atmospheric pollen, *Alternaria* spores were found in the air in varying abundance in many parts of the United States from May through November, the active season proving longer than for ragweed pollen (with graphs and a map). Spore statistics are presented from 40 stations totaling over 5,000 observations, and observational data are also included for other fungi.

Cercospora species and their host genera, C. CHUPP (*Ithaca, N. Y.: Cornell Univ., 1937, pp. 23*).—Lists of *Cercospora* species (alphabetized by specific names) and of host genera, reciprocally cross-referenced, are included.

Host specialization in Coleosporium solidaginis and C. campanulae, E. B. MAINS (*Mich. Acad. Sci., Arts, and Letters, Papers 23 (1937), pp. 171–175*).—As a result of studies of *C. solidaginis* (1931–34) from *Solidago canadensis*, *Pinus resinosa*, and *Aster novae-angliae*, it is deemed evident that various physiologic races occur and that a situation here exists apparently as complicated as in the cereal rusts. From studies of *C. campanulae* (1932–34) originating from *Campanula americana*, it is concluded that the American rust is an additional specialized form differing from those reported in Europe.

The variations observed in the reaction within host species noted in a number of studies indicate that accurate comparisons are impossible unless strains of host species of genetic identity for rust reaction are used in the different investigations. Evidently too much emphasis has been placed on the reaction of host species, not only in the separation of specialized races but also in the delimitation of species of rusts.

Studies on Rhizoctonia solani Kühn.—IV, Effect of soil temperature and moisture on virulence, G. B. SANFORD (*Canad. Jour. Res., 16 (1938), No. 5, Sect. C, pp. 203–213, pl. 1, figs. 2*).—Continuing this series (E. S. R., 79, p. 351), at 25° C. the disease diminished very abruptly, while at 16°–23° the pathogen appeared equally virulent throughout the soil moisture range studied (19–40 percent capacity). In a fertile, steam-sterilized loam at medium moisture content it required ± 10 days for the fungus to grow as far as it did on the surface of a nutrient medium in 4 days. The growth rate at 23° or 16° was slightly higher in the wet soil than in one of medium moisture content, but in dry soil the rate was somewhat less at 23° than at 16° in a medium wet soil. Even in a fairly dry soil at 16° growth reached 5 cm in 10 days—apparently adequate for infecting young sprouts from a set bearing viable sclerotia. Progress toward recovery by means of secondary and tertiary sprouts from the attacked primary sprout was better in a wet than in a dry soil at both 16° and 23°, the best progress being in a wet soil at 23°. A distinction is drawn between the effects of soil moisture and temperature in stimulating host growth and their effect on parasitism itself. The remarkable tendency of secondary sprouts to escape infection, regardless of soil temperature and moisture, is indicated. There was evidence that factors other than soil temperature and moisture may play an important role in the parasitism of *R. solani*.

Dispersion and growth of bacterial cells suspended in agar, G. L. MCNEW (*Phytopathology, 28 (1938), No. 6, pp. 387–401, figs. 3*).—To determine the reliability of the dilution-plate method for single-cell cultures of phytopathogenic bacteria, observations were made on the distribution and growth of the cells suspended in agar. Broth cultures were mixed with melted nutrient-dextrose agar, which, after hardening, was sliced, stained, and examined under oil immersion. Over 99 percent of the loci occupied by *Phytomonas stewartii* had isolated single cells, and 80–94 percent of these cells grew. Comparable results were secured in dilution plates prepared by several technics, and mixtures of virulent and avirulent cells were separated in the dilution plates. *P. campestris*, *P. phaseoli*, *P. angulata*, *P. savastanoi*, *P. pisi*, *P. tabaci*, *P. pruni*,

P. translucens undulosa, and *Erwinia carotovora* gave results similar to those with *P. stewartii*, but the percentage of single cells was lower (89–97) with *P. michiganensis*, *P. juglandis*, *P. tumefaciens* (three strains), and *P. insidiosa*. *P. fascians* was the only species in which groups of cells occurred in the agar, but there was no evidence that melted agar caused this agglutination since the clumps existed in culture before suspension in the agar.

Physiologic and serologic studies of the soft-rot and colon group of bacteria, A. R. Stanley (*West Virginia Sta. Bul. 287 (1938), pp. 35*).—A 2-yr. physiological study was made of 120 cultures of soft-rot and colon bacteria, 58 of which were also studied serologically. In the fermentation of dextrose, lactose, and sucrose, 43 organisms made 67 changes, while 38 cultures changed at least once from one generic "type" to another. Only 8 produced indole, and one of these lost the ability. In the nitrate reduction tests, 13 organisms changed in their reaction. Variations in the Voges-Proskauer tests were shown by 17, while 30 changed their reaction to methyl red medium. In ability to grow in Koser's citrate solution, 24 organisms varied. Of 43 cultures isolated from soft rots, only 24 could be identified, the remaining 19 being intermediate types.

Seven bacterial cultures from stalk rot of sweet corn were tested serologically against an antiserum from one of their number, five proving serologically identical. Though the members of this group were physiologically identical, one showed only a moderate agglutination, while another showed none whatever. *Bacillus coli communis* and *B. atrosepticus* agglutinated in an antiserum of an organism causing stalk rot, while *B. coli communior* did not.

It is concluded that the soft-rot bacteria undoubtedly belong in the colon-typhoid-dysentery group of bacteria, but that their final classification can come only after a complete study of the entire group.

Growth substance and the development of crown gall, S. B. Locke, A. J. Riker, and B. M. Duggar. (Wis. Expt. Sta. et al.). (*Jour. Agr. Res. [U. S.], 57 (1938), No. 1, pp. 21–39, figs. 5*).—When inoculated with *Phytomonas tumefaciens*, tomato, *Bryophyllum pinnatum*, and *Kalanchoe diagremontiana* exhibited the following symptoms indicating abnormally high concentrations of growth substance: Increased epinasty of petioles, increased initiation of adventitious roots, increased cambial activity, suppressed development of axillary and adventitious buds, and delayed abscission of petioles. More growth substance was detected with Went's *Avena* technic in inoculated than in uninoculated tomato stems. No significant difference in ability to produce growth substance in peptone medium was detected between virulent and attenuated strains of *P. tumefaciens*. Proliferation of tissues inoculated with the attenuated strain was stimulated slightly by substances diffusing down the stem from the host plant foliage, also by a high concentration (3 percent) of β-indoleacetic acid applied in lanolin to the tips of decapitated stems, and strongly by substances from galls induced by the virulent strain. It is considered that the evidence now available is inadequate for assigning to β-indoleacetic acid a major role in crown gall development, and the authors are inclined toward an explanation based upon production of growth substance of the auxin-a or auxin-b type by the host cells under the influence of the bacteria.

Viruses—living or non-living? R. A. Gortner. (Univ. Minn.). (*Science, 87 (1938), No. 2267, pp. 529, 530*).—The author weighs existing evidence and concludes that it does not exclude the possibility that viruses may be living obligate parasites possessing characteristics like hypothetical nuclei devoid of cytoplasm.

Isolation and properties of virus proteins, W. M. Stanley (*Ergeb. Physiol., 39 (1937), pp. 294–347, figs. 20*).—This monograph (with bibliography of 215

titles) reviews the early history of virus studies, and discusses the more recent chemical studies on the tobacco mosaic virus, the isolation of a crystalline protein possessing virus activity and measurement of this activity, the general properties of crystalline tobacco mosaic virus protein, ultracentrifugal studies on this virus protein and its isolation from different hosts, correlation of virus activity and protein by centrifugation, immunological properties of tobacco mosaic virus protein, isolation of virus protein from plants diseased with different strains of this virus, the relation of tobacco mosaic virus protein to intracellular crystalline deposits, and the isolation of other high molecular weight virus proteins, including those of tobacco ring spot, potato latent mosaic, severe etch, cucumber mosaic, Shope papilloma, equine encephalomyelitis, bacteriophage, and vaccine.

The reproduction of virus proteins, W. M. STANLEY (*Amer. Nat., 72 (1938), No. 739, pp. 110–123, fig. 1*).—From a summary of known facts concerning the virus proteins, the author presents speculative explanations concerning their reproduction, their reproduction only in certain living cells, the rapid rate in some cases and the slow rate in others, the "mutation" of one strain into one or more other strains, the immunity from other strains resulting from infection with one strain, and the failure of one virus to immunize against a different one. Because certain virus proteins are available in large amounts and readily lend themselves to experimentation, it is believed that we are now in position to pursue with great expectation the problem of reproduction of the virus proteins and eventually that even more interesting problem concerning protoplasmic growth in general.

Ultracentrifugal isolation of high molecular weight proteins from broad bean and pea plants, H. S. LORING, H. T. OSBORN, and R. W. G. WYCKOFF (*Soc. Expt. Biol. and Med. Proc., 38 (1938), No. 2, pp. 239–241*).—After three ultracentrifugations of the juice of *Vicia faba* plants infected with pea virus 1 (a virus difficult to transmit by mechanical means) the supernatant fluid failed to infect any of 10 plants, while the heavier centrifugate infected 4 of 10 inoculated plants. The low specific activity of the sedimented protein indicated that it was not a pure virus, which was confirmed when ultra centrifugation of the juice from healthy plants yielded a similar noninfectious heavy protein. It was apparent that either the concentration of the virus principle in the final solutions was too low for detection by the analytical centrifuge or the virus had the same sedimentation constant as one of the normal constituents. A similar demonstration of heavy proteins was made for healthy plants of *Pisum sativum arvense*. Similar ultracentrifugal procedures have not isolated homogeneous macromolecules from the juice of healthy tobacco plants, and if such exist they are either highly unstable or are present only in minute amounts.

A study of wilt resistance of cotton in south Mississippi, D. C. NEAL (Coop. U. S. D. A.). (*Mississippi Sta. Circ. 99 (1938), pp. 7, figs. 2*).—It is concluded that Dixie-Triumph, Miller, and certain strains of D. & P. L. cottons are best adapted to the wilt-infested sections of southern Mississippi and similar areas of the Gulf Coastal Plain. The S. C. strain of Dixie-Triumph was one of the most resistant varieties tested, and is said to be productive, with uniform fiber and staple of the desired length. Other varieties are discussed. Varieties tolerant or semiresistant to *Fusarium vasinfectum* frequently yield more seed cotton per acre than those showing higher resistance. Although several of the wilt-resistant varieties produced satisfactory yields under heavy wilt infestation, it is believed that further improvement in productiveness and quality may be expected from continued crossing and selection.

Effect of 1, 2, 5, 6-dibenzanthracene on Fusarium lini, L. D. WRIGHT and A. K. ANDERSON (*Soc. Expt. Biol. and Med. Proc., 38 (1938), No. 3, pp. 370–*

372, fig. 1).—Since it has been suggested that cancer may be associated with an abnormal glucose metabolism, it was believed to be of interest to study the effect of a typical carcinogenic hydrocarbon on the growth and glucose utilization of *F. lini*, which is known to grow well on a medium composed of mineral salts and glucose as the only carbon source. The data presented indicate that water-soluble derivatives of 1,2,5,6-dibenzanthracene, after an inhibiting period, stimulated the activities of this fungus as shown by an increase in weight of the mycelium and a more rapid utilization of glucose.

Eye-spot disease of Napier grass, R. K. Voorhees. (Fla. Expt. Sta.). (*Phytopathology, 28 (1938), No. 6, pp. 438–443, figs. 3*).—A disease causing considerable damage to certain selections of *Pennisetum purpureum* in Florida was found to be due to *Helminthosporium ocellum*, the cause of eyespot of sugarcane in Florida and Cuba. The name characterizes this disease of Napier grass also, and is justified by the reddish, somewhat oval to elongate spots, with light-brown centers. Plants from susceptible stock artificially inoculated in the greenhouse developed the disease, while inoculated plants from immune stock and the noninoculated controls developed no signs of it.

Influence of rotations under irrigation on potato scab, Rhizoctonia, and Fusarium wilt, R. W. Goss and M. M. Afanasiev (*Nebraska Sta. Bul. 317 (1938), pp. 18, figs. 6*).—In the previously published abstract of this paper (E. S. R., 79, p. 350), a typographical error occurred in the last sentence, which should read: "With short rotations, use of manure is advised, while with *Fusarium* wilt a problem, corn preceding potatoes is not recommended."

Powdery-scab of potatoes, P. E. Tilford. (Ohio Expt. Sta.). (*Ohio Veg. Growers Assoc. Proc., 23 (1938), pp. 103, 104*).—This note reports the finding of this disease in Ohio and summarizes data on the symptoms, cause, and control. It is believed that control measures are not likely to be necessary there.

Report on potato virus diseases in 1937, T. P. Dykstra. (U. S. D. A.). (*Amer. Potato Jour., 15 (1938), No. 6, pp. 157–164*).—This is a review of 19 papers (mostly from non-American sources) published in 1937, in which the principal findings are reported.

The biological basis for certification of seed potatoes, J. G. Leach (*Amer. Potato Jour., 15 (1938), No. 5, pp. 117–130*).—This discussion includes a digest of present information regarding tuber transmission of important potato diseases, based on investigations by various workers in different regions as well as by the author.

Report of seed certification conference, C. W. Edgerton. (La. State Univ.). (*Amer. Potato Jour., 15 (1938), No. 5, pp. 130–140*).—This reports the results of a conference at Baton Rouge, La. (Apr. 5–8, 1938) held to discuss problems connected with the certification of seed potatoes and to approve rules and regulations that might be adopted by the various States.

Studies of selected strains of curly top virus, N. J. Giddings. (U. S. D. A.). (*Jour. Agr. Res. [U. S.], 56 (1938), No. 12, pp. 883–894, pl. 1, figs. 2*).—Four strains (designated 1, 2, 3, and 4) were recognized by the differential reactions of sugar beet varieties, the percentages of infected plants and severity of symptoms being the bases for comparison. Strains 1 and 3 induced severe symptoms in susceptible beets, but strain 3 was hardly able to infect the resistant beet used while strain 1 infected a high percentage of resistant beets and induced very obvious symptoms. Strains 2 and 4 induced mild symptoms in susceptible beets, but strain 4 infected only a small percentage of the resistant beets while strain 2 infected a high percentage of them but induced very mild symptoms. The highly resistant beet variety 1167 showed distinctive reactions to all of the strains, and the differences were highly significant statistically. Tobacco and tomato were not infected by virus strains 2 or 4.

Plantain (*Plantago erecta*), peppergrass (*Lepidium nitidum*), and the Great Northern bean variety were not infected by strain 2.

Sugarcane report to contact committee, C. W. Edgerton. (La. Expt. Sta.). (*Sugar Bul., 15 (1937), No. 21, pp. 4, 6, 7*).—This is a progress report on work with mosaic, with special reference to varietal susceptibility and resistance, recovery, and control measures.

Chlorotic streak. (U. S. D. A.). (*Sugar Bul., 16 (1938), No. 17, pp. 3, 4*).—The apparent discovery of this sugarcane disease, probably due to a virus, is reported by E. V. Abbott for Louisiana.

Stem galls of sugar cane induced with an insect extract, J. P. Martin (*Hawaii. Planters' Rec. [Hawaii. Sugar Planters' Sta.], 42 (1938), No. 2, pp. 129–134, figs. 5*).—The author reports three tests in which stem galls were induced by inoculation with an extract prepared by macerating green leafhoppers (*Draeculacephala mollipes*) in the presence of a small amount of distilled water. These outgrowths appeared only when the inoculation was made in tissue capable of making further growth.

The molecular weight and shape of tobacco mosaic virus protein, M. A. Lauffer (*Science, 87 (1938), No. 2264, pp. 469, 470*).—A brief review of the work of others and additional findings presented by the author are believed to emphasize the necessity of knowledge of the shape and state of hydration of this virus protein to enable one to interpret accurately the data from the ultracentrifuge.

An estimate of the relative dimensions and diffusion constant of the tobacco-mosaic virus protein, V. L. Frampton and H. Neurath. (Cornell Univ.). (*Science, 87 (1938), No. 2264, pp. 468, 469*).

Partial reactivation of formolized tobacco mosaic virus protein, A. F. Ross and W. M. Stanley (*Soc. Expt. Biol. and Med. Proc., 38 (1938), No. 2, pp. 260–263*).—The demonstration here reported that addition of formaldehyde to virus protein results in a simultaneous decrease of activity, of amino groups, and of reducing groups, and that under conditions favoring removal of formaldehyde the virus activity is regained and the number of such groups increases, is taken to indicate that certain of these groups play at least a partial role in the structure necessary for virus activity. These results are deemed direct experimental evidence that this activity is a specific property of the virus protein.

Bunt reaction of some varieties of hard red winter wheat, H. A. Rodenhiser and K. S. Quisenberry. (U. S. D. A. and Tex., Okla., Kans., Colo., Nebr., Minn., Mont., Utah, and W. Va. Expt. Stas.). (*Jour. Amer. Soc. Agron., 30 (1938), No. 6, pp. 484–492*).—Bunt nurseries of 50 varieties and strains were grown for 1–6 yr. on land of the cooperating experiment stations, the inoculum in each case being a composite of collections of *Tilletia levis* and *T. tritici* from random-selected fields in the State where the tests were made. None proved to be bunt-free at all stations, but a large number were resistant. Oro, Martin, and Hussar, and Minturki to a limited extent, contributed factors for resistance, in hybrid lines, to the bunt races used (except the Montana races). Inoculated individually, these four wheats were susceptible to certain races from Montana and other wheat-growing areas. It is concluded that bunt-resistant reactions determined by bulk-inoculum tests should be considered only as preliminary evidence, and that such tests should be supplemented by inoculations with known races.

Only 10 of the wheats tested proved resistant to the so-called "dwarf" smut race of *T. tritici* prevalent near Logan, Utah, and in the Gallatin Valley, Montana. Factors for resistance to this race were present in Martin, Hussar, Ioturk, and Relief wheats.

Relative effectiveness of controlling different physiologic races of bunt by seed disinfection, J. F. Martin and R. Sprague. (U. S. D. A. and Oreg. Expt. Sta.). (*Jour. Amer. Soc. Agron., 30 (1938), No. 5, pp. 390–394*).—Under the environal conditions (5 yr.) at Pendleton and Corvallis, Oreg., there were no consistent differences in relative effectiveness of controlling any of the 12 races and collections of *Tilletia tritici* and *T. levis* tested. A positive relationship was found between the amount of bunt in the untreated check rows and the effectiveness of control by seed disinfection, in which formaldehyde and copper and organic mercurial fungicides were used.

The wheat stem rust epidemic of 1937 in Kansas, C. O. Johnston, L. E. Melchers, and J. O. Miller. (Coop. Kans. Expt. Sta.). (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 1938, Sup. 107, pp. 83–94, figs. 5*).—The authors record the meteorological conditions as compared with 1935, and discuss crop conditions in relation to the epidemic, the source of inoculum and progress of the epidemic, the distribution, prevalence, and severity of stem rust, the magnitude and types of losses, and the reactions of the principal commercial wheat varieties.

Abnormal germination of wheat caused by organic mercurials, W. F. Crosier. (N. Y. State Expt. Sta.). (*Assoc. Off. Seed Anal. North Amer. Proc., 23–26, (1930–33), p. 284*).—From a case of injury described it is concluded that under improper storage conditions seed treated with Ceresan may be permanently damaged. Careless handling of the seed, especially when severe cracking of the seed coats results, may also be a factor conducive to chemical injury.

Organic mercury fungicides and disease resistance in the control of slender wheat grass smut, A. W. Henry, S. B. Clay, and J. R. Fryer (*Canad. Jour. Res., 16 (1938), No. 5, Sect. C, pp. 195–202*).—Infection of *Agropyron pauciflorum* by *Ustilago bullata* was completely controlled by treating naturally or artificially smutted seed with three organic mercury dusts containing ethyl mercury phosphate, methyl mercury nitrate, and methyl mercury phosphate, respectively, 0.5 oz. per bushel proving satisfactory and causing no appreciable injury after storage of the seed for a year. Several Alberta collections of this host and of intermediates between *A. pauciflorum* and *A. subsecundum* were highly resistant or immune to inoculation, while others proved moderately or highly susceptible. The superior variety of slender wheatgrass Frya is shown to be highly resistant but not immune. As long as susceptible strains are grown, continuance of seed treatment is advised.

Pathological aspects of seed testing, R. H. Porter. (Iowa Expt. Sta.). (*Assoc. Off. Seed Anal. North Amer. Proc., 23–26 (1930–33), pp. 128–131*).—This is a brief summary of the results of many years of seed germination tests and studies of seed-borne fungus parasites with special reference to corn, but with data also on small grains, vegetable crops, and potato seed tubers. The determination of resistance to specific diseases by greenhouse tests is referred to. With respect to corn it was significant that most of the dead and weakly germinating kernels were infected, while those with strong germination were largely free from dry rot organisms. Early picked corn, sorted over in the spring to remove poor ears, when seed-treated gave practically as high a yield as nearly disease-free seed either treated or untreated. Early picking, careful drying, and storage in a dry place are advocated.

Control of muck crop diseases, J. D. Wilson. (Ohio Expt. Sta.). (*Ohio Veg. Growers Assoc. Proc., 23 (1938), pp. 16–23*).—A popular discussion.

Insoluble copper compounds for spraying vegetables, J. D. Wilson. (Ohio Expt. Sta.). (*Ohio Veg. Growers Assoc. Proc., 23 (1938), pp. 35–41*).—The essential facts have been previously noted (E. S. R., 79, p. 345).

Cabbage seedbed diseases and cabbage yellows in evidence, O. A. Reinking and W. O. Gloyer (*Farm Res. [New York State Sta.], 4 (1938), No. 3, p. 3, fig. 1*).—The authors trace seedling injury to damping-off, wiry stem, and canker, all due to *Rhizoctonia*. These three types of injury may be satisfactorily controlled by soil treatment with corrosive sublimate or calomel. Notes on cabbage yellows are included.

Cabbage seed treatment trials, 1937, J. H. Muncie. (Mich. State Col.). (*Fruit Prod. Jour. and Amer. Vinegar Indus., 17 (1938), No. 9, p. 271*).—An abstract of data.

Studies on blackheart, soft-rot, and tarnished plant bug injury of celery, J. K. Richardson (*Canad. Jour. Res., 16 (1938), No. 4, Sect. C, pp. 182–193, pls. 3, figs. 3*).—Blackheart incidence was not correlated with saturated soil or with the use of various fertilizers, but under artificial conditions the disease was induced in susceptible plants by subjection to 85°–95° F. in a humid atmosphere. Experimental data supplemented by field observations indicated that (1) the disease is physiological in nature, (2) early plantings are more severely affected, (3) the most extensive injury occurs as the plants approach maturity, (4) vigorous plants are more subject to attack, (5) there are varietal differences in susceptibility, and (6) the appearance of the disease in the field is usually preceded by a period of high humidity or temperature, or of both.

Besides the soft rot due solely to *Erwinia carotovora* (=*Bacillus carotovorus*), necrotic blackheart tissues under favorable conditions often become infected by this organism, which, as a secondary decay, destroys the plant. *Lygus pratensis* is said to be of economic importance as a soft-rot vector, and considerable injury, differing in appearance from both blackheart and soft rot, may be caused by its feeding habits.

Comparisons of fungicides for control of celery leaf blights, R. Nelson and R. W. Lewis (*Michigan Sta. Quart. Bul., 20 (1938), No. 4, pp. 210–221, fig. 1*).—This is a detailed summary of dusting and spraying tests on this important Michigan crop, with special reference to the early and late blights due, respectively, to *Cercospora apii* and *Septoria apii-graveolentis*. The beneficial effects of sulfur have suggested certain combinations in the dust fungicides which may lead to the development of effective new mixtures without the disadvantages from excess lime in the 20–80 copper sulfate-lime. With suitable materials added to increase the adherent properties of dusts such as Basicop and Cuprocide, it is believed that they will be acceptable substitutes. However, until these substitutes have been developed and thoroughly tested, bordeaux mixture (8–12–100) and the 20–80 copper sulfate-lime dust are recommended for field use in the State.

Bacterial wilt of sweet corn in Mexico, C. Elliot (*Phytopathology, 28 (1938), No. 6, pp. 443, 444*).—The author reports the collection in Orizaba, Mexico, of corn leaves infected with bacterial wilt (*Aplanobacter stewarti*=*Phytomonas stewartii*) and of corn flea beetles (*Chaetocnema pulicaria*). This is the first report of the disease and of its insect vector from Mexico.

The ultracentrifugation of the proteins of cucumber viruses 3 and 4, W. C. Price and R. W. G. Wyckoff (*Nature [London], 141 (1938), No. 3572, pp. 685, 686, fig. 1*).—In this study of the virus proteins of cucumber viruses 3 and 4, their sedimentation rates proved to be like unaltered tobacco mosaic virus protein but they differed in being practically insoluble in pure water. Special interest was attached to the presence in cucumber plants of a homogeneous high molecular weight substance other than the virus protein. It is believed reasonable to expect that further study of such substances may throw light on the nature and origin of the virus proteins.

Mosaic of lima beans (Phaseolus lunatus macrocarpus), L. L. HARTER (U. S. D. A.). (*Jour. Agr. Res.* [*U. S.*], *56* (*1938*), *No. 12, pp. 895–906, pls. 3*).—A lima bean mosaic similar to cucumber and celery mosaic is described which differs slightly in symptomatology on several different hosts. The Jackson Wonder, Hopi, Florida Speckled, Florida Butter, Henderson Bush, Woods Prolific, Willow Leaf, and Sieva varieties of lima beans proved susceptible. This virus differs slightly from the cucumber virus in symptomatology and in some of its physical properties, but does not differ enough to be classed as distinct. It is proposed, therefore, that it be designated as the lima bean mosaic strain of cucumber virus.

Variety studies in relation to Fusarium wilt of peas, B. L. WADE, W. J. ZAUMEYER, and L. L. HARTER (*U. S. Dept. Agr. Circ. 473* (*1938*), *pp. 27, figs. 2*).—A total of 1,334 strains of peas were grown on wilt-infested (*F. orthoceras pisi*) soil during a period of 3 yr., 477 of them being from a world-wide collection and used to determine the distribution of resistance. Susceptible or partially susceptible varieties proved to be more common in England than elsewhere, while no susceptible varieties were obtained from Ethiopia, where peas are believed to have originated. The relationships of certain types and varieties to resistance and susceptibility are discussed. Although resistance is nearly five times as common as susceptibility, most of the important American strains of garden and canning varieties were found to be susceptible.

It is concluded from the wide distribution of resistance and its occurrence in presumably primitive types and in old varieties that the gene for resistance is probably older than the gene for susceptibility. Speculations on the origin and survival of these genes, on distribution, and on climatic tolerance of the pathogen are included.

A root rot of peas caused by Fusarium coeruleum, L. L. HARTER (*Phytopathology, 28* (*1938*), *No. 6, pp. 432–438, fig. 1*).—This *Fusarium*, though not previously recognized as infecting peas, is shown to be a vigorous parasite and widely distributed in the United States. No resistance or tolerance was shown by any of 24 varieties of peas planted in artificially infested soil, but pigeonpea (*Cajanus indicus*) proved to be immune. The temperature range of the pathogen corresponded to that of the temperature permitting growth of the host.

The new leaf mold resistant tomato, L. J. ALEXANDER. (Ohio Expt. Sta.). (*Ohio Veg. Growers Assoc. Proc., 23* (*1938*), *pp. 64–69*).—This reports further progress (E. S. R., 78, p. 503) in the development of a leafmold-resistant tomato. Three strains have been distributed for trial by growers.

Tomato spraying trials, J. H. MUNCIE and G. KENKNIGHT (*Michigan Sta. Quart. Bul., 20* (*1938*), *No. 4, pp. 247–250*).—In 2-yr. spray tests, Oxo Bordo, Coposil, and Cuprocide depressed the yields less than bordeaux mixture at 4–6–100, while Cuprocide (2–100+spreader) gave the best protection against *Septoria* leaf spot and early blight. None of the materials increased the yields over the control plants during these two seasons in which infection was not severe. Until the fungicidal value of these newer sprays can be tried against severe infection conditions, it is concluded that bordeaux mixture will remain the recommended spray for the two diseases noted.

Diseases of fruits and vegetables observed on the Chicago and New York markets in 1937 (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 1938, Sup. 106, pp. 61–82*).—The following two contributions are included: Fruit and vegetable diseases on the Chicago market in 1937, by G. B. Ramsey; and diseases of fruits and vegetables on the New York market during 1937, by C. O. Bratley and J. S. Wiant.

Market diseases of fruits and vegetables: Crucifers and cucurbits, G. B. RAMSEY, J. S. WIANT, and G. K. K. LINK (*U. S. Dept. Agr., Misc. Pub. 292*

(*1938*), *pp. 74, pls. 23*).—This is a handbook, illustrated in part with colored plates, and with 209 literature citations.

The zinc-chloride treatment for fire-blight, D. CATION. (Mich. Expt. Sta.). (*Mich. State Hort. Soc. Ann. Rpt., 66* (*1936*), *pp. 132–135*).—This summarizes local tests on pear trees with this treatment, originated by Day (E. S. R., 59, p. 746), and gives recommendations for trials in the State.

Steam sterilization of apple boxes for blue mold, R. H. WELLMAN and F. D. HEALD (*Washington Sta. Bul. 357* (*1938*), *pp. 16*).—Direct exposure to streaming steam for 1 min. proved sufficient to kill a very high percentage of *Penicillium expansum* spores, those dried for 2 weeks being more readily killed than those dried for a few hours only. Spores mixed with rotted apple tissue in contact with apple-box wood were harder to kill than those free of such tissue. Spores between two pieces of wood, though somewhat protected from the steam, were killed within 2 min. Spores on artificially v. naturally contaminated box wood did not differ appreciably in their resistance. For old picking boxes which are to be used again, it is concluded that a 2-min. exposure to streaming steam would kill all blue mold spores present.

Conidia from infected bud-scales and adjacent wood as a main source of primary infection with the apple scab fungus Venturia inaequalis (Cooke) Wint., R. MCKAY (*Roy. Dublin Soc., Sci. Proc., n. ser. 21* (*1938*), *No. 57, pp. 623–640, pl. 1*).—A distinct correlation was found between the severity of scab on the tree (season of 1936), the percentage of diseased buds the following winter, and the outbreak and development of scab on the tree the following May and June.

Copper sprays tested in the 1937 Illinois spray schedule, H. W. ANDERSON, K. J. KADOW, and D. POWELL. (Univ. Ill.). (*Ill. State Hort. Soc. Trans., 71* (*1937*), *pp. 255–269*).—On the basis of one season's results, it is believed that no copper spray thus far tested can be safely used at any time in the apple-scab spray schedule, though several of them cause much less injury than bordeaux mixture and do control scab. Apple blotch was controlled under especially severe test conditions by several of the insoluble sprays. Cupro-K and bordeaux 34 proved most satisfactory for cherry leaf spot, followed by liquid lime-sulfur. It is believed that nearly all of these compounds hold promise, but that all such materials must be made safer before they can be recommended for general use.

Recent results on the use of several new copper spray materials on apples, E. J. RASMUSSEN. (Mich. Expt. Sta.). (*Mich. State Hort. Soc. Ann. Rpt., 67* (*1937*), *pp. 32–34*).—In the 1937 tests against apple scab, the amount of foliage retained by the trees sprayed with most of the copper compounds used was similar to that under wettable sulfur treatment, while liquid lime-sulfur caused more defoliation than all but one form of the copper materials tried. It is concluded that further experimental work is necessary to determine the value of these newer copper compounds.

The rust of stone fruits, J. C. DUNEGAN. (Ark. Expt. Sta. and U. S. D. A.). (*Phytopathology, 28* (*1938*), *No. 6, pp. 411–427, figs. 2*).—The rust fungus commonly known as *Tranzschelia pruni-spinosae* attacks both wild and cultivated *Prunus* species throughout the world. In this study it was found that urediospores from cultivated hosts could infect peach but not the leaves of wild species of *Prunus*. Conversely, urediospores from various wild species did not infect peach leaves. Aeciospores from wild species of *Anemone* did not infect peach leaves but infected leaves of wild *Prunus* species, whereas aeciospores from *A. coronaria* (cultivated) infected peach leaves but not those of wild *Prunus* species. Examination of 389 herbarium specimens showed that the teliospores produced on leaves of cultivated *Prunus* species differ morphologically from those produced on leaves of wild species. These results necessitate a revision of the

present concept of Persoon's original species, which is considered separable into two varieties according to the combination of aecial and telial hosts and the differences in teliospore morphology. The combination *T. pruni-spinosae typica* is proposed for the variety found on wild species and *T. pruni-spinosae discolor* for the one attacking cultivated species. Technical descriptions are included.

Spraying experiments on sour cherries in Michigan, E. J. RASMUSSEN. (Mich. Expt. Sta.). (*Mich. State Hort. Soc. Ann. Rpt., 66 (1936), pp. 49–54*).—This summary of recent work leads to the recommendation that growers who obtain good leaf spot control with lime-sulfur should continue its use. Because of its injurious effects bordeaux mixture is not advised. Some of the newer copper compounds gave promise, and appeared safe enough to be tried out commercially in a limited way.

Evaluating spray materials for cherry leaf spot control, D. CATION. (Mich. Expt. Sta.). (*Mich. State Hort. Soc. Ann. Rpt., 66 (1936), pp. 48, 49*).

Copper spray materials for the control of cherry leaf-spot, D. CATION. (Mich. Expt. Sta.). (*Mich. State Hort. Soc. Ann. Rpt., 67 (1937), pp. 86–88*).—In 1937 spray tests, a number of the newer copper compounds gave complete control of leaf spot in a four-spray program where lime-sulfur failed completely under the same conditions.

Basicop as a cherry spray, D. CATION and C. W. ROBERTSON (*Michigan Sta. Quart. Bul., 20 (1938), No. 4, pp. 199–210, figs. 5*).—Basicop-lime (3–8–100) controlled leaf spot satisfactorily with little perceptible injury of any form. With 1 lb. or less of lime it proved unsatisfactory in some of the tests owing to copper injury. At 1.5–100 it failed to give satisfactory control, though much superior to liquid lime-sulfur at 2.5–100. At this and weaker concentrations lime-sulfur failed to control with the number and timing of applications in several of the tests. Bordeaux mixture (3–4–100 and 6–8–100) controlled leaf spot satisfactorily, but tended to dwarf the fruit in proportion to the concentration, but in one test with a 4–5–50 mixture applied in two preharvest sprays no dwarfing resulted.

The timing of cherry spray applications in relation to spray materials, C. W. ROBERTSON (*Mich. State Hort. Soc. Ann. Rpt., 67 (1937), pp. 81–85*).—As a result of two orchard spray tests against cherry leaf spot, the author calls attention to the necessity of critical timing of liquid lime-sulfur applications, whereas with the copper materials 2–3 days' difference did not materially matter. With the present schedule, the time between the 4-weeks' spray and the after-harvest spray is deemed far too long for a liquid lime-sulfur sprayed orchard, but copper materials usually exerted efficiency even after that period of time. A prebloom spray for the copper compounds was indicated.

Cherry spray recommendations for 1938, E. J. RASMUSSEN. (Mich. Expt. Sta.). (*Mich. State Hort. Soc. Ann. Rpt., 67 (1937), pp. 89–94*).

A new disease threatening the future of the persimmon, R. K. BEATTIE (*Jour. Wash. Acad. Sci., 28 (1938), No. 4, p. 205*).—The disease proved to be due to *Cephalosporium* sp.

Raspberry disease control, R. F. SUIT (*Farm Res. [New York State Sta.], 4 (1938), No. 3, p. 8*).—Brief notes on the control of mosaic, spur blight, and mildew.

Two distinct strains of the nematode Aphelenchoides fragariae occurring on strawberry plants in the United States, J. R. CHRISTIE. (U. S. D. A., Mass. Expt. Sta., et al.). (*Jour. Agr. Res. [U. S.], 57 (1938), No. 1, pp. 73–80, figs. 2*).—Strawberry plants infested with the strawberry strains of *A. fragariae* from Cape Cod and North Carolina, respectively, were grown side by side at Wareham, Mass., and at Willard, N. C. Wherever symptoms developed they

were characteristic of the region from which the nematodes originated rather than of that in which the plants were grown. Plants infected with *A. fragariae* from North Carolina and grown at Wareham, Mass., developed symptoms during the first summer but not during the following two summers, and at the end of the third season the infestation had disappeared. Plants infested with *A. fragariae* from Cape Cod and grown at Willard, N. C., developed symptoms periodically throughout the experiment, and at the end of a second summer in the southern climate there was no significant reduction in the nematode population. The terms "spring dwarf" and "summer dwarf" are proposed for the Cape Cod and southern types of the disease, respectively, which, it is concluded, are caused by two physiological strains of *A. fragariae*.

Preliminary note on the bacteriophage for Bacterium citri (Hasse) Doidge, T. Matsumoto and N. Okabe (*Agr. and Hort. [Tokyo], 12 (1937), No. 8, pp. 2055–2059, fig. 1, Eng. abs., p. 2059; also Taihoku Imp. Univ., Faculty Sci. and Agr., Phytopath. Lab., Misc. Rpts., No. 4 (1937), pp. 5, fig. 1, Eng. abs., p. 5*).—It is suggested that this lytic principle isolated by the authors may play a role in the destruction of the citrus canker organism present in the soil.

Experiments disclose more facts on zinc control of mottle-leaf, E. R. Parker. (Calif. Citrus Expt. Sta.). (*Citrus Leaves, 18 (1938), No. 4, pp. 5, 6, 20, 21*).—Experiments and observations are said to indicate responses to zinc treatment in proportion to the severity of the citrus mottle-leaf symptoms. Increased yields of good quality fruit may follow if the symptoms are marked, but if no symptoms are evident it is deemed probable that no response will be found. Sprays containing zinc compounds have proved to be the most effective treatment tried, those recommended being equally satisfactory when applied at various seasons and usually effective for 2–3 yr. Spreaders are apparently unnecessary, and certain combination sprays appear feasible. If the condition is severe, dusts should not be depended upon for complete control. Detailed recommendations are included.

The influence of various types of rind injury on the incidence of water spot of navel oranges, L. J. Klotz and A. J. Basinger. (Calif. Citrus Expt. Sta.). (*Calif. Dept. Agr. Bul., 27 (1938), No. 2, pp. 232–241, figs. 2*).—From this and previous studies it is concluded that water spot is a nonparasitic breakdown, the most important factor being the imbibition of external water by the albedo of the rind. Invasion of the water-affected area by fungi, principally blue and/or green molds, later may cause a rapid decline of the fruit ("water rot"). In California the trouble is important only on navel oranges which mature during the rainy season, and fresh wounds are important factors in its incidence. Old, calloused, or healed scars from various injuries to the rapidly growing young fruits do not affect the incidence of water spot. Preliminary laboratory tests indicate the possibility of decreasing these losses by a protective spray of paraffin wax emulsion. Early picking, orchard heating, windbreaks, and care in avoiding fruit injury are advocated.

The spread of decline disease in date palms, D. E. Bliss. (Calif. Citrus Expt. Sta.). (*Calif. Dept. Agr. Bul., 27 (1938), No. 2, pp. 219–227, figs. 3*).—This work has been noted from another source (E. S. R., 78, p. 808). The illustrations are additions to the original publication.

A bacteriosis of dahlia, Erwinia cytolytica, F. D. Chester (*Phytopathology, 28 (1938), No. 6, pp. 427–432*).—This is primarily a soft rot of the stem, followed by wilting, but when infection starts at the base or at the soil level a soft rot of the tuber may follow. The pathogenicity of *E. cytolytica* n. sp. was established by inoculations.

The black-spot disease of roses, and its control under greenhouse conditions, E. W. Lyle ([*New York*] *Cornell Sta. Bul. 690 (1938), pp. 31, figs. 3*).—

This disease, due to *Diplocarpon rosae* and serious in most commercial rose houses, was found to attack all greenhouse varieties under favorable conditions, though some were affected more than others. From the standpoint of premature defoliation, as much as 20 percent difference was observed between healthy and diseased individuals. The symptoms are described. Only secondary cycles of the fungus are said to be common in greenhouses, the pathogen being carried over between seasons in leaves left during pruning or brought in on infected replants. An average of 32,000 conidia per leaf spot 6.3 mm in diameter was estimated from data on outdoor roses. Dissemination is accomplished mainly by splashing water. Prewetting of the conidia proved necessary for germination and contact with water or extreme humidity for leaf infection. Temperature was not as important under greenhouse conditions, except as it affected humidity.

Syringing for red spider mites is given as the principal reason for the spread and severity of black spot under glass, and the substitution of pyrethrum-rotenone or selenium-containing spray for syringing proved effective in its control—the latter material being the more satisfactory. A fungicidal protectant, such as dusting sulfur, proved partially effective as a preventative. Other control methods tried, such as hand-picking the infected leaves or circulating the air by fans to disperse high humidities around the leaves, failed to accomplish their purpose. Negative results were also obtained from the use of additional manure or fertilizer.

"Broken" tulips are diseased, F. P. McWhorter and P. Brierley. (U. S. D. A. and Oreg. Expt. Sta.). (*Florists Exch. and Hort. Trade World, 90 (1938), No. 24, pp. 15, 18*).—A general discussion for growers, based on a 6-yr. study.

A survey of diseases and defects in Connecticut forests, R. Kienholz and C. B. Bidwell (*Connecticut [New Haven] Sta. Bul. 412 (1938), pp. 489–559, figs. 21*).—The stated purpose of this survey was to determine the kind, abundance, and distribution of the diseases and defects in the forests of the State and the effects of species, composition, age, and other stand and site characteristics on their prevalence. The results indicate the present condition of the stands examined in four representative areas, and should serve as a basis for determining the best method for reducing the damage from various causes and, by comparison with future studies, the degree of effectiveness of present treatments. The main deleterious factors discussed are *Nectria* and *Strumella* cankers, decay of living trees, frost cracks, top damage, mechanical injuries, miscellaneous lesions, borer injuries, and fire scars. A one-page bibliography is included.

Bark canker of Monterey cypress, H. A. Edson. (U. S. D. A.). (*Internatl. Bul. Plant Protect. [Roma], 12 (1938), No. 5, p. 98M*).—This notes a new destructive disease of *Cupressus macrocarpa* due to *Coryneum cardinalis* in California.

The tumor disease of oak and hickory trees, N. A. Brown (*Phytopathology, 28 (1938), No. 6, pp. 401–411, figs. 4*).—A tumor disease of oak and hickory resembling crown gall in appearance is described. From this, over a period of years, no single isolation of the crown gall bacterium has been obtained, but it was found to be associated with a *Phomopsis* here shown to be the cause. Two strains were isolated which proved to be cross inoculable between oak and hickory and also pathogenic to and producing galls more readily on viburnum, privet, and jasmine. Three types of pycnospores are produced. In isolating from a gall taken directly from a tree, *Phoma*-like spores are formed first. Later, after chilling, these cultures produce *Phomopsis* spores of *a* and *b* types. Thus far no perfect stage has been found either in nature or in culture. The entrance of the pathogen and the spread of infection are

discussed. It is stated that the galls and cankers of oaks are not manifestations of the same disease.

Similar galls found on maples and elms are also referred to, but from which no crown gall bacteria could be isolated. However, the associated fungus from both hosts produced *Phoma*-like pycnospores.

Vitamin B_1 in the nutrition of four species of wood-destroying fungi, N. L. NOECKER. (Univ. Wis.). (*Amer. Jour. Bot., 25 (1938), No. 5, pp. 345–348, fig. 1*).—Vitamin B_1 was found necessary for the growth of *Stereum frustulosum*, *Hydnum erinaceus*, *Polyporus spraguei*, and *Fomes igniarius* on a medium made up of chemically pure ingredients, but there was considerable variation in response. Nitrogen may be given in either organic or inorganic forms, the more complex being the more effective. Dextrose may be utilized as a carbon source, but xylose proved superior for *S. frustulosum*, the only species tested in this respect.

ECONOMIC ZOOLOGY—ENTOMOLOGY

The essentials of a wildlife range, R. T. KING (*Jour. Forestry, 36 (1938), No. 5, pp. 457–464*).—It is pointed out that the requirements of wild animals vary according to species, sex, and age; in addition the requirements of the animals included in each of these groups vary with the seasons and according to their physiological activities. The essentials of a wildlife range are those minimum requirements that must be available to each species inhabiting that range. Certain of these essentials are in the nature of materials required by animals to meet physiological demands; others are in the nature of pattern, that is, an arrangement of the materials that complies with their inherent limitations in the matter of cruising radii and saturation points.

The muskrat as native and alien, T. I. STORER (*Jour. Mammal., 18 (1937), No. 4, pp. 443–460, figs. 6*).—A discussion, contributed from California, of the muskrat (*Ondatra zibethica*), its native distribution, transplantation, transplant and spread in Europe, and transplants in North America, with a list of 19 references to the literature cited.

Muskrat investigations in Dorchester County, Md., 1930–34, F. R. SMITH (*U. S. Dept. Agr. Circ. 474 (1938), pp. 24, pls. 6*).—Report is made of an intensive study of the life history of the Eastern Shore, or Virginia, muskrat (*Ondatra zibethica macrodon*) from 1930 to 1934, which included animals on the marshes and animals confined to pens under controlled conditions. The evidence indicates that the black and brown color phases of this species are inherited, black being a recessive and brown a dominant character. It appears that unusually high floods, extreme drought, and extreme cold are disastrous to muskrats. Three-square sedge (*Scirpus olneyi* or *S. americanus*) and cattails (*Typha*) are the chief foods, but almost any available plant is eaten. Some animal food is taken. The breeding season extends throughout most of the year, with an intensive period from mid-March to about the first week in September. Muskrats may breed three times a year, but the penned animals produced only two litters a year at most. Litters on the open marsh average between four and five young; in pens, three. Three species of mites found on marsh animals were identified as *Tetragonyssus spiniger*, *Ichoronyssus spiniger*, and a new species of *Listrophorus*. Three species of endoparasites were found and identified: A tapeworm (*Taenia crassicollis*) and a nematode of the genus *Dirofilaria* (probably *D. immitis*) in penned animals and a fluke (*Parametorchis* sp.) in a marsh animal. Evidences of abscesses were noted, and a degenerated condition of the kidney, septicemia, coccidiosis, inflammation of the eyes, and leukemia were diagnosed. Gallstones were found in one animal.

A bibliography of 23 titles is included.

Experimental evidence on the eating of bob-white eggs by small Sciuridae, P. L. ERRINGTON (*Jour. Mammal., 19 (1938), No. 1, pp. 107, 108*).—The information presented supplements earlier data relating to both primary and secondary nest destruction of bobwhite quail in southern Wisconsin by the striped ground squirrel (*Citellus tridecemlineatus*) and possibly other sciurids (E. S. R., 70, p. 355). In a series of experiments, 23 of 25 eastern chipmunks (*Tamias striatus*), 13 of 15 striped ground squirrels, and 1 flying squirrel (*Glaucomys volans*) examined or vainly tried to open bobwhite eggs made available to them but thereafter lost interest. One chipmunk and 2 ground squirrels ate eggs from the beginning. A second chipmunk, exceptionally interested in eggs but unsuccessful in opening them, was given a pricked egg for encouragement, after which it opened additional eggs unaided. Both chipmunks and ground squirrels opened eggs in much the same way and usually with some difficulty.

An early report of lead poisoning in waterfowl, I. D. WILSON (*Science, 86 (1937), No. 2236, p. 423*).—Reference is made to an early finding by H. H. Bailey that ducks, geese, and swans, particularly in Backbay, Va., and Currituck Sound, N. C., were being poisoned through ingesting lead shot that remained in their gizzards until ground away.

A Bufo marinus of exceptional size, F. A. BIANCHI (*Hawaii. Planters' Rec. [Hawaii. Sugar Planters' Sta.], 42 (1938), No. 2, pp. 109, 110, figs. 2*).—Record is made of a female giant toad taken in Kapahulu which weighed 2 lb. 9 oz. and had a body length of 7⅜ in., a width of 6$\frac{7}{16}$ in., and a girth of 15½ in. at the largest part of the abdomen.

The giant African snail (Achatina fulica (Fér.)) discovered in Hawaii, C. E. PEMBERTON (*Hawaii. Planters' Rec. [Hawaii. Sugar Planters' Sta.], 42 (1938), No. 2, pp. 135–140, pl. 1, fig. 1*).—A brief account is given of the giant African snail *A. fulica*, an omnivorous and highly destructive plant pest, which entered Hawaii from Japan through the mails in November 1936. The discovery that it was being raised for food or medicinal purposes in a hatchery at Makawao, Maui, resulted in the destruction of 1,387 snails from 2 mo. to 1.5 yr. of age and of a large quantity of newly hatched snails. Quotations from the literature recording the pest, of which a list of 10 references is given, then follow.

[Notes on economic insects and their control] (*Jour. Econ. Ent., 31 (1938), No. 3, pp. 455–461, fig. 1*).—The notes here presented (E. S. R., 79, p. 501) are as follows: Nicotine Sulphate Plus Summer Oil for the Control of Tentiform Leaf Miners [*Ornix geminatella* Pack.], by R. Hutson (p. 455) (Mich. State Col.); [Hop] Flea Beetle Injury to Sugar Beets in Central Utah, by H. E. Dorst (pp. 455, 456) (U. S. D. A.); Tobacco Flea Beetle Outbreak, by W. J. Schoene (p. 456) (Va. Expt. Sta.); Identity of the Common Species of American *Trichogramma*, by S. E. Flanders (pp. 456, 457) (Calif. Citrus); The Pyralid Moth *Lineodes integra* Zell. as a Pest of Eggplant, by R. E. Campbell (pp. 457, 458) (U. S. D. A.); Reaction of the Codling Moth to Nicotine Exposed in Apple Trees, by R. H. Smith (pp. 458, 459) (Univ. Calif.); New Control Methods for the Corn Ear Worm, by G. W. Barber (p. 459) (U. S. D. A.); European Parasites of *Rhyacionia buoliana* (Schiff.), *Coleophora laricella* Hbn., and *Phyllotoma nemorata* (Fall.), by P. B. Dowden and P. A. Berry (pp. 459, 460) (U. S. D. A.); A Larval Mermithid, *Mermis subnigrescens* Cobb, as a Parasite of the Honeybee, by V. G. Milum (p. 460) (Univ. Ill.); and Methyl Bromide Vapor Against Five Species [Granary Weevil, Bean Weevil, *Trogoderma versicolor* (Creutz), Square-Necked Grain Beetle, and the Dark Mealworm] of Stored Product Insects, by W. R. Piper, Jr., and R. H. Davidson (pp. 460, 461) (Ohio State Univ.).

[Work in economic zoology and entomology by the Indiana Station], O. W. FORD, G. A. FICHT, C. M. PACKARD, G. E. GOULD, G. E. MARSHALL, T. E.

HIENTON, H. O. DEAY, L. F. STEINER, G. C. ODERKIRK, and E. B. STEEN. (Partly coop. U. S. D. A.). (*Indiana Sta. Rpt. 1937, pp. 9, 10, 46–54, 58, 59, figs. 4*).—Reference is made (E. S. R., 77, p. 360) to work with the codling moth (including field and laboratory insecticide tests, sanitation, spray residue, and light traps), European corn borer, chinch bug, hessian fly, armyworm, cutworms, corn earworm, tomato root nematode, tarnished plant bug, cucumber beetles, miscellaneous vegetable insects, oriental fruit moth and introduced parasites, apple leafhopper, periodical or 17-yr. cicada, European elm scale, household roaches, white grubs, rodents, and winter survival, nesting, and parasitic infestation studies with quail.

[Report of work in economic entomology and zoology by the Ohio Station] (*Ohio Sta. Bul. 592 (1938), pp. 41–53, 129, 130, fig. 1*).—A report is made of the work of the year (E. S. R., 77, p. 658) with borer control in newly set shade trees and the black wheat-stem sawfly, both by J. S. Houser; apple flea weevil, by Houser and R. B. Neiswander; survival and weight of European corn borer larvae fed on etiolated leaf tissue, corn resistance to southern corn rootworm, and poison bran mash for cutworm control in corn, all by L. L. Huber; oriental fruit moth and the strawberry leaf roller (see p. 657), both by R. B. Neiswander; the annual white grub (*Ochrosidia villosa* Burm.) (see p. 662), grub-proofing of soil with lead arsenate treatment, May beetle survey, and an earwig (*Euborellia annulipes* (Lucas)) attacking radishes in the greenhouse, all by C. R. Neiswander; the codling moth, by C. R. Cutright; onion thrips, varietal differences in potato leafhopper populations (E. S. R., 79, p. 221), and effect of different copper-lime ratios on the potato leafhopper, all by J. P. Sleesman; bean weevil and cabbageworm control, both by H. L. Gui; extent of winter losses of honeybees in Ohio, by W. E. Dunham; and forest insect survey, by [J. B.] Polivka.

[Work in entomology by the Puerto Rico College Station] (*Puerto Rico Col. Sta. Rpt. 1937, pp. 82–102, 159–161*).—The work of the year (E. S. R., 78, p. 362) includes studies (1) to maintain a supply of the vedalia for prompt distribution where new infestations of the cottony-cushion scale or old ones become seriously destructive, by G. N. Wolcott and F. Seín, Jr., (2) of the dry wood termite "polilla" *Cryptotermes brevis* Walk., by Wolcott, (3) to determine the effectiveness of various commercial miscible oils and other sprays in the control of the West Indian peach scale and the gray scale *Pseudoparlatoria ostreata* Ckll. on papaya, by Wolcott and Seín, (4) to control *Sipha flava* Forbes, the yellow aphid of sugarcane, by Wolcott, (5) to determine the length of time for which the control of the banana root borer can be maintained absolutely and commercially effective, in which properly pared or sterilized seed has been used and proper precautions taken to prevent immediate infestation at time of planting, by Seín and E. Molinary Salés, (6) to control the coffee leaf miner *Leucoptera coffeella* Guer., by Seín, (7) to devise a completely effective poison bait for the control of the hormiguilla *Myrmelachista ramulorum* Wheeler in coffee groves and (8) to establish *Larra americana* Sauss., parasite of the changa in Puerto Rico, both by Wolcott, and (9) to control the sugarcane borer by means of the release of artificially reared egg parasites (*Trichogramma minutum* Riley), by Wolcott and L. F. Martorell. At the Isabela Substation, in cooperation with the station, studies were conducted by Wolcott and A. Riollano (1) to determine the effectiveness of dusting or spraying twice a week with pyrethrum and rotenone preparations in preventing the oviposition by the female of the Caribbean pod borer in lima beans, and (2) to determine whether flooding (complete submersion) of onion plants will control the onion thrips.

[Contributions on entomology in Puerto Rico] (*Jour. Agr. Univ. Puerto Rico [Col. Sta.], 22 (1938), No. 2, pp. 171–225, pls. 3, figs. 4*).—Contributions

here presented include the following: New South American Sarcophagidae (Diptera), by D. G. Hall (pp. 171–176) (U. S. D. A.), which includes descriptions of three new species and the erection of the genus *Abacantha*, all from Venezuela; Antillean Ascalaphidae, by N. Banks (pp. 177–180), including a description of a new species from Puerto Rico and one from Haiti; *Euxesta stigmatias* Loew, an Otitid Fly Infesting Ear Corn in Puerto Rico, by B. A. App (pp. 181–188) (U. S. D. A.), a serious pest of corn, especially roasting ears for market purposes, that is generally distributed throughout the tropical part of the Western Hemisphere (the maggots enter the corn ears, making control rather difficult, although experimental control measures used against the corn earworm were found to reduce the number of ears infested by the maggots); Description and Biologic Notes on a *Tiphia* (Hymenoptera: Scoliidae) From Haiti (pp. 189–192), which occurs in abundance at Kenschoff, Haiti, and is described as new under the name of *T. hispaniolae*, and The Introduction Into Puerto Rico of *Larra americana* Saussure, a Specific Parasite of the "Changa," or Puerto Rican Mole-Cricket (*Scapteriscus vicinus* Scudder), [From Cuba] (pp. 193–218), both by G. N. Wolcott (both P. R. Col. Expt. Sta.); and New Species of *Nemocera* From Puerto Rico, by O. A. Johannsen (pp. 219–225) (Cornell Univ.), seven new species of which are described, with notes on the occurrence of others and a key to the North American species of the psychodid genus *Maruina*.

[Report of work in entomology by the Wisconsin Station]. (Partly coop. U. S. D. A.). (*Wisconsin Sta. Bul. 449 (1938), pp. 18–31, figs. 2*).—The work of the year referred to relates to a pyrethrum fly spray that protects cattle for 9 hr., by E. M. Searls and F. M. Snyder; cutworm control, by L. D. Beadle and H. F. Wilson; control of white grubs, by T. R. Chamberlin, L. Seaton, C. L. Fluke, J. A. Callenbach, and P. O. Richter; rotenone dust for cabbage-worm control, by T. C. Allen and J. W. Brooks; contact sprays for control of the squash vine borer and a soap substitute as spreader in vegetable sprays, both by Allen; pea aphid control, by Wilson; aphid resistance in canning peas, by C. D. Harrington, Searls, and R. A. Brink; codling moths in western Wisconsin orchards, by Callenbach; and insecticide tests for control of the fruit tree leaf roller and black cherry aphid, by J. H. Lilly.

The insect depredators of purslane (Portulaca oleracea L.), H. J. Romm (*Fla. Ent., 20 (1937), Nos. 3, pp. 43–46, 47; 4, pp. 51–61*).—The known host interrelationship of insects that attack weeds and cultivated plants led to an investigation of the natural enemies of purslane. A search of the literature, field operations, and rearings resulted in the finding of 83 species that attack purslane. A summary including reference to the part of the plant affected is presented in table form. A list of 155 references to the literature is included.

A method for measuring effects of dormant sprays upon apple tree growth, J. H. Lilly. (Wis. Expt. Sta.). (*Jour. Econ. Ent., 31 (1938), No. 3, pp. 388–393, figs. 2*).—A description is given of a method which is designed to measure dormant oil effects on apple trees and which has been successfully used in Wisconsin over a period of 5 yr. "It has the advantages of being quantitative, reasonably rapid, and simple, and differences are readily subject to statistical analysis to determine their significance. It is equally well adapted to measuring both beneficial and injurious effects; results obtained with it over the period indicated have shown a consistent trend. A ruler and clip board are the only equipment required, and the counts can be made at any time after trees are in full foliage. It is not applicable to poorly-pruned old trees where little growth is being made."

Coal tar distillates in dormant and delayed dormant sprays on apple trees, J. M. Ginsburg and B. F. Driggers. (N. J. Expt. Stas.). (*Jour. Econ. Ent., 31 (1938), No. 3, pp. 393–400*).—Experiments conducted with aphids and

the European red mite on several varieties of apple trees are reported, the details being given in six tables. "The dormant sprays consisted of emulsified neutral tar oils, emulsified petroleum and tar oils combined, and emulsified petroleum oil to which various concentrations of cresylic acid were added. The delayed dormant spray consisted of emulsified petroleum oil and 0.5 percent cresylic acid. The results obtained during the past 4 yr. in two commercial orchards suggest the following conclusions: Of the various dormant sprays tested, an emulsion containing 3 percent petroleum oil and about 2.5 percent neutral tar oil is equal in efficiency to the present New Jersey delayed dormant spray in controlling apple aphids and European red mite. It causes no noticeable injury or retardation to the buds. The dormant spray has an advantage over the delayed dormant spray in that it can be applied over a longer period of time. It has a disadvantage in that its present cost is considerably higher." A list of 16 references to the literature cited is included.

A chemical study of mixtures of lime sulfur and lead arsenate, W. S. Hodgkiss, D. E. H. Frear, and H. N. Worthley. (Pa. Expt. Sta.). (*Jour. Econ. Ent., 31 (1938), No. 3, pp. 443–455, figs. 4*).—The results of an investigation of the chemical changes which occur in the spray solution before application to the host plant are presented in nine tables and four graphs. It was found that "over a 1-hr. period lime-sulfur solution was stable toward oxidation in solutions more concentrated than 1–100. The solutions contained quantities of soluble sulfur, the amount of which depended upon the dilution of the concentrate. A period of 45 hr. was necessary for the decomposition of the sulfide sulfur in a lime-sulfur solution diluted 1–50. Thiosulfates and sulfur as the sulfate were formed in solution as the sulfide disappeared. . . . Decomposition of lime-sulfur by the addition of lead arsenate was found to be greater in the dilute mixtures than in the concentrated. In solutions more concentrated than 1–50, the decomposition appeared to be a constant quantity. The effect of a change in temperature upon the decomposition of lime-sulfur by lead arsenate appeared to be only as an alteration of the rate of decomposition. Arsenic appeared to be rendered soluble in the solution, the amount of which was relative to the quantity of hydrogen sulfide evolved from the solution. Lime added to mixtures of lime-sulfur and lead arsenate prevented the decomposition of the sulfide sulfur of the solution. The arsenic in solution was decreased as the proportion of lime was increased. . . . Quadruple mixtures containing lime-sulfur, lead arsenate, lime, and skim milk in the dry form in proportions of 8 oz., 1, 2, and 3 lb. in 100 gal. of solution showed a protection from decomposition of the sulfides, the amount of which depended upon the proportion of lime and dried skim milk that was present in the mixture. A compilation of the percentages of sulfide-sulfur found to be present in the solutions from the quadruple mixtures indicates that mixtures containing equivalent quantities of both lime and dried skim milk will give the greatest protection to the lime-sulfur from decomposition by lead arsenate. The percentage of sulfide-sulfur, however, did not attain the values found in solutions of lime-sulfur at the same concentration."

Relative toxicities to insects of acid lead arsenate, calcium arsenate, and magnesium arsenate, H. S. Swingle. (Ala. Expt. Sta.). (*Jour. Econ. Ent., 31 (1938), No. 3, pp. 430–441, fig. 1*).—In the studies reported, the details of which are given in 12 tables, phosphates were found to be a component of the digestive secretions of the 9 species of insects used in the tests, namely, the banded cucumber beetle, the Mexican bean beetle, the Colorado potato beetle, the striped blister beetle, the bollweevil, ***Monocrepidius lividus*** (DeG.), the corn earworm, the walnut caterpillar, and the tomato worm. It was found that the formation of soluble arsenic from acid lead arsenate, calcium arsenate, and

magnesium arsenate was largely dependent on the H-ion concentration of the solution. It was influenced to a lesser extent by the concentration of acids, bases, and salts in the solution. "The presence of phosphates greatly increased the amount of soluble arsenic formed from acid lead arsenate in alkaline solutions. This was apparently due to precipitation of part of the lead as lead phosphate, as this compound was found to be very insoluble in alkaline solutions. Phosphates influenced the solubility of the arsenic in calcium and magnesium arsenates to only a slight extent. The relative toxicity of acid lead arsenate, calcium arsenate, and magnesium arsenate to 9 species of phytophagous insects was shown to be correlated with the relative amounts of soluble arsenic formed from these arsenates in phosphate solutions having the same pH as was found in the midguts of these insects. For insects having an alkaline reaction in their midgut, acid lead arsenate was most toxic and magnesium arsenate least toxic. For insects having an acid reaction of pH 6.0 in their midgut, magnesium arsenate was most toxic and acid lead arsenate least toxic. It appears possible to predict the relative order of toxicity of acid lead arsenate, calcium arsenate, and magnesium arsenate to chewing insects if the H-ion concentrations in the insects' midguts are known."

A list of 28 references to the literature cited is given.

Evaluating derris and cubé: The question of total extractive content, H. A. Jones and W. N. Sullivan. (U. S. D. A.). (*Jour. Econ. Ent., 31 (1938), No. 3, pp. 400–405*).—Determinations made of the total extractive content of several samples of derris and cube roots by various extraction procedures and the additional extractive content and mortality to mosquito larvae of marcs of derris and cube roots from various extraction procedures are reported upon in two full-page tables. "Of several solvents tested for the determination of total extractive content of derris and cube roots from the standpoint of selective extraction of the toxic material, chloroform was the most satisfactory. Soxhlet extractions for 7 hr. with this solvent gave satisfactorily complete extraction of the toxic material. Results by the room-temperature, aliquot procedure were in fair agreement with these, although on the average slightly lower. Because of the convenience of the determination, particularly when rotenone is being determined on the sample by the same method, the latter procedure is suggested as suitable for determination of total extractive content."

Effect of addition of oil on the toxicity to plant bugs of derris and other insecticides, R. A. Fulton and N. F. Howard. (U. S. D. A.). (*Jour. Econ. Ent., 31 (1938), No. 3, pp. 405–410, figs. 4*).—Laboratory tests are reported, the details being given in two tables. The toxicity of derris, nicotine, nicotine sulfate, and anabasine sulfate to the squash bug was found to be markedly increased by the use of oils, especially peanut oil. Also, the toxocity of derris was greatly increased when acetone was added to the powder 24 hr. before use, and still further increased when peanut oil was used. Freshly prepared derris extract was very effective. The vegetable oils increased the toxicity a much greater degree than the mineral product. The large milkweed bug *Oncopeltus fasciatus* (Dall.) was found to be less resistant to insecticides than the squash bug and to be relatively more susceptible at the higher humidity. A few tests with the milkweed bug indicate that mineral oil is practically as effective as the peanut oil, but this was not the case in tests with the squash bug. However, all of the oils increase the toxicity of derris.

"Foliage tests in the field on five varieties of half-grown squash plants indicate that two applications of sprays containing derris (0.015 percent rotenone) and 1 percent of one of the following oils were not injurious to the plant: Olive, peanut, tea-seed, and petrolatum."

The particle size of commercial insecticidal sulfurs as determined by sedimentation analysis, L. D. GOODHUE. (U. S. D. A.). (*Jour. Econ. Ent., 31 (1938), No. 3, pp. 410–414, fig. 1*).—The results of particle size distribution and percentage above 325 mesh in sulfur insecticidal samples determined by sedimentation analysis are reported in table form. "A new method of dispersion in which is used a wetting agent composed of a mixture of saponin and ammonium caseinate in ammoniacal 50 percent alcohol was found to give very good results on a wide variety of samples. The flotation pastes and suspensions of colloidal sulfur were found to contain the most fine material. A material made by a special process ranks next. Except for two coarsely ground crude samples, the ground sulfurs fall in about a medium fine class. The sublimed flowers are variable and may be either fine or coarse. The percentage through 325 mesh was found to give very little indication of the amount of very fine sulfur in a sample."

A list is given of 13 references to the literature cited.

The fumigation of insects with hydrocyanic acid: Effect of different air pressures, W. MOORE and E. L. CARPENTER (*Jour. Econ. Ent., 31 (1938), No. 3, pp. 419–426, figs. 3*).—An apparatus which may be used either for the determination of sorption or the toxicities of different vapors or gases on insects at air pressures from complete vacuum to atmospheric pressure is described.

"A study has been made of the susceptibility of several different insects to hydrocyanic acid at different air pressures. The best kills of confused flour beetles were obtained with inactive insects at 1–2 mm air pressure, whereas the best kills of rice weevils, granary weevils, flat grain beetles, tobacco beetles, and saw-toothed grain beetles were obtained at 30–60 mm, where the insects were active. The lesser grain borer showed no difference in kill between 2 and 60 mm air pressure. The percentage kills decreased in all cases studied as the air pressure increased from about 60 mm to atmospheric pressure. The reduction in kill due to the presence of air in the fumigation chamber has been shown to be due to nitrogen as well as oxygen. Sorption experiments have shown that active rice weevils take up much larger quantities of hydrocyanic acid than inactive rice weevils, whereas no difference was found between active and inactive confused flour beetles. It appears that some insects (typified by the rice weevil) are able to prevent the penetration of hydrocyanic acid to some extent when they become inactive, whereas other insects (typified by the confused flour beetle) are not able to accomplish this result."

The non-toxicity of gossypol to certain insects, E. P. BREAKEY and H. S. OLCOTT (*Science, 87 (1938), No. 2248, p. 87*).—Tests made by the authors on the woolly apple aphid and the Mexican bean beetle indicate that gossypol and dianiline gossypol are ineffective either as contact or as stomach poisons.

***A study of the polymorphism in Forficula auricularia* L.,** R. PAULIAN (*Ann. Ent. Soc. Amer., 30 (1937), No. 4, pp. 558–562, figs. 3*).—The author has found that, based on morphological differences in the forceps, there are two forms of the male European earwig.

The increasing importance of the cockroach Supella supellectilium Serv. as a pest in the United States, E. A. BACK (*Ent. Soc. Wash. Proc., 39 (1937), No. 8, pp. 205–213, pls. 2, figs. 2*).—A summary of information on *S. supellectilium*, a cockroach of tropical countries which has become established in cities in the United States.

Thysanoptera of the geenton, J. R. WATSON (*Fla. Ent., 20 (1937), Nos. 1, pp. 12–15, fig. 1; 2, pp. 17–21, fig. 1*).—A continuation of the contribution previously noted (E. S. R., 76, p. 361).

Controlling the squash bug, J. L. HOERNER (*Colorado Sta. Press Bul. 93* (*1938*), *pp. 8, figs. 5*).—This is a practical account of means of control of the squash bug. Included is a brief reference to field tests made on a ¾-acre field of hubbard squash divided into 16 plats. The best results were obtained from a plat that was dusted June 22 and every third day thereafter until August 5 with a mixture of 1 part dry pyrocide to 5 parts of dusting gypsum. With 13 applications of dust using 200 lb. to the acre the average yield was 12.15 tons an acre. A plat dusted on the same days as the above with a mixture of stabilized pyrethrum 1 part, copper oxychloride 1 part, and dusting gypsum 8 parts, using 175 lb. to the acre in 13 applications, gave an average yield of 7.68 tons an acre. Hand-picking the plats daily from June 22 to July 15 resulted in an average yield of 8.73 tons an acre, while the untreated check gave a yield of 4 tons an acre.

Peanut "pouts," Z. P. METCALF. (N. C. Expt. Sta.). (*Science, 86* (*1937*), *No. 2234, p. 374*).—Laboratory and field experiments are said to have proved that the disease of peanut plants locally known as peanut pouts, which closely resembles the condition in potatoes known as tipburn, is caused by the potato leafhopper. In field plants protected from leafhoppers the disease did not develop, whereas unprotected plants developed the disease. Plants in the field that had the disease but were freed from leafhoppers and kept free recovered. It was shown that the disease known as pouts is caused by what is termed the mass effect of toxins.

Conditioning agents for increasing the effectiveness of rotenone-bearing dusts against the pea aphid, T. E. BRONSON and J. E. DUDLEY, JR. (U. S. D. A. and Wis. Expt. Sta.). (*Jour. Econ. Ent., 31* (*1938*), *No. 3, pp. 415–419*).—The authors found that in both the greenhouse and the field derris or cube dust mixtures conditioned with a spreading and wetting agent are superior as an insecticide against the pea aphid to plain derris or cube dust mixtures. "Under field conditions this superiority of the conditioned dust mixtures has amounted to approximately 12 percent, which may be the difference between satisfactory and unsatisfactory aphid control. In general, conditioned derris or cube dust mixtures reinforced by the addition of nicotine or an aliphatic thiocyanate have been superior to conditioned dust mixtures. This has been especially true in instances where the aliphatic thiocyanate was added."

Sugar cane mealybug control on seed cane, with special reference to cold water treatment, at the North Florida Experiment Station, J. D. WARNER (*Fla. Ent., 20* (*1937*), *No. 1, pp. 6, 7*).—A general infestation of mealybugs (*Pseudococcus calceolariae* Mask.) on all varieties of sugarcane is said to have been noted at the North Florida Substation in September 1934. Cane clean stripped and submerged for 25 min. in a tank containing a 0.25-percent solution of nicotine sulfate at 65° F. plus a soap spreader and planted immediately was found more or less generally infested the following September. Cane carefully washed with brushes in a soap solution and submerged for 30 min. in tanks containing a 5-percent solution of letbane 420 plus lethane spreader was found comparatively free from mealybugs in November 1936. Cane submerged in lethane solution with lethane spreader for 12 hr. was found free from mealybngs when clean stripped in November 1936. Cane of nine varieties completely submerged on February 24, 1936, in an artificial lake through which a considerable stream of clear spring water was flowing, from which the cane was removed 7 days later, is said to have made an excellent growth and was found when clean stripped in November 1936 to be entirely free from mealybugs.

It is concluded from this work that the cold-water treatment is effective and economically feasible.

Occurrence of the grass mealybug Antonina indica Green on sugar cane, C. E. PEMBERTON (*Hawaii. Planters' Rec.* [*Hawaii. Sugar Planters' Sta.*], *42* (*1938*), *No. 2, pp. 107, 108, fig. 1*).—The so-called grass mealybug *A. indica*, which occurs in Hawaii mostly on the nodes of Bermuda grass, has been found on sugarcane on rare occasions. The author now records its having been found massed on nodes particularly of Lahaina cane growing in sand cultures at the experiment station in pots on a wooden platform raised several inches off the ground.

Introduction into the Hawaiian Islands of Mexican enemies of the avocado mealybug, H. T. OSBORN (*Hawaii. Planters' Rec.* [*Hawaii. Sugar Planters' Sta.*], *42* (*1938*), *No. 2, pp. 153–158, fig. 1*).—The collection and shipping of three parasites of the coconut mealybug, namely, *Hyperaspis silvestrii* Weise, *Curinus coeruleus* (Muls.), and *Pseudaphycus utilis* Timb., and their introduction into Hawaii are considered and notes given on other enemies of mealybugs.

The stupefaction of red scale (Aonidiella aurantii) by hydrocyanic acid, D. L. LINDGREN (*Hilgardia* [*California Sta.*], *11* (*1938*), *No. 5, pp. 213–225, figs. 2*).—Most workers having found that the California red scale becomes stupefied when prefumigated with a sublethal concentration of hydrocyanic acid gas, an investigation to determine the length of time that it remains stupefied was conducted. The results of this work indicate that there are *two definite strains of the California red scale in southern California. It was* shown that under laboratory conditions, with rapid and complete diffusion of hydrocyanic acid gas, a high-peak concentration offers only a slight advantage, if any, over a low, uniform type of concentration on the resistant strain. A greater percentage survive a normally lethal charge of HCN if they have been exposed to a sublethal dosage of the gas immediately before the regular fumigation. The effects of the sublethal charge are about the same after a 1-hr. interval, but after 2-hr. and 3-hr. intervals the insects have come out of their stupor and are actually easier to kill. After 4 hr. the insects appear to react normally again to a uniform concentration of HCN, that is, as though no stupefaction had occurred. A sudden high-peak concentration does not overcome the effects of a stupefying charge. Results obtained by the stupefaction and fumigation of the laboratory-reared scale are similar to those obtained with the scale from the field. The nonresistant California red scale requires 1 hr. before the stupefying charge is effective, as indicated by a large reduction in kill, and remains stupefied even after an interval of 3 hr. between the sublethal charge and the normally lethal charge of HCN.

The granary weevil is readily stupefied by a low concentration of hydrocyanic acid gas, whereas the confused flour beetle and the convergent ladybeetle are not thus affected.

The development of resistance to hydrocyanic acid in certain scale insects, H. J. QUAYLE (*Hilgardia* [*California Sta.*], *11* (*1938*), *No. 5, pp. 183–210, figs. 3*).—Following a brief introduction and review with 18 references to the literature, investigations are reported, the details being given in 16 tables. In the fumigation work 3 of the important citrus scales of California, namely, the California red scale, the black scale, and the citricola scale, from certain localities in the State exhibited a greater tolerance or resistance to hydrocyanic acid gas than the same insects from other localities. In the California red scale and the black scale such resistance has been noted since 1912 or 1914 and still exists, while in the citricola scale it has been recognized since

1925. Considering the length of time fumigation has been practiced with the citricola scale, resistance developed much more rapidly than in the case of the California red scale and the black scale. Experiments reported herein indicate that at least the California red scale from different localities also exhibits a difference in tolerance to fumigants other than HCN, including methyl bromide and ethylene oxide. It is suspected that this same difference in resistance may be shown to other fumigants not yet tested. The areas where resistance has developed in the California red scale, the black scale, and the citricola scale represent only a small part of the total citrus area in California. Outside of these resistant areas, fumigation continues to be the most satisfactory treatment for control, and even in the case of the resistant California red scale, fumigation is still the most satisfactory single treatment. The black scale and the citricola scale, representing unarmored scales, are more easily controlled by spraying than the California red scale; hence spraying is more generally employed in the areas where the black scale and the citricola scale are resistant.

Spraying and dusting for cabbage worm control, H. L. Gui (*Ohio Sta. Bimo. Bul. 192 (1938), pp. 113–118*).—The results of dusting and spraying experiments for the imported cabbageworm, the cabbage looper, and the larva of the diamondback moth, which seriously damage the leaves of cabbage and related crops grown in Ohio, conducted in 1934, 1935, 1936, and 1937, and the effect of dusting and spraying upon yield are presented in six tables. The work led to the recommendation that the cabbage crop be dusted or sprayed at 10-day intervals with paris green (1 lb. with 10 lb. diluent, or 2 lb. to 50 gal. water) or derris powder (1 lb. derris with 4 percent rotenone to 7 lb. diluent). Flour is an excellent diluent for paris green, and when it is mixed half-and-half with other diluents, such as talc, diatomaceous clay, or lime, the adhesive qualities of the dust are greatly increased. A spreader and sticker is necessary, fish oil meeting the requirements when used at the rate of 2 oz. to 50 gal. of spray material. Desirable diluents for derris powder are flour, talc, diatomaceous clay, dusting gypsum, and finely ground tobacco stems. Derris powder sprays should consist of 1.5 lb. of derris powder containing 4 percent rotenone in 50 gal. of water. When other grades of derris powder are used, dosage should be so calculated that the spray contains 0.015 percent of rotenone. A spreader and sticker should be used.

The eastern tent caterpillar, F. M. Wadley (*U. S. Dept. Agr. Leaflet 161 (1938), pp. [1]+4, figs. 3*).—A practical account.

The strawberry leaf roller (Ancylis comptana (Froel.)) in Ohio, R. B. Neiswander. (Ohio Expt. Sta.). (*Jour. Econ. Ent., 31 (1938), No. 3, pp. 382–385*).—The results of control work with the strawberry leaf roller in 1936 and 1937 indicate that the use of either natural or synthetic cryolite is a very effective means of control for this pest. "Both natural and synthetic cryolite appear equal in effectiveness and may be used in either dust or spray form. The use of a spreader is advisable in spray applications, especially if a considerable number of leaves is folded at the time of treatment. The foliage should be well covered when the first eggs are hatching, and coverage should be maintained during the period that larvae are actively feeding. Three applications at weekly intervals largely cover the activities of one brood. In the Ohio experiments this program effected a commercial control.

"Seasonal conditions involving both the insect and the crop may limit the preharvest treatments to two or even one because of residue complications. If this hazard develops and an additional treatment is needed, Dry Pyrocide Dust may be substituted for cryolite in the application immediately preceding harvest.

In all instances of serious early season damage a vigorous postharvest program of fluorine treatments should be executed if the planting is permitted to stand."

Biology and control of the strawberry crown borer (Tyloderma fragariae (Riley)) in Kentucky, P. O. RITCHER. (Ky. Expt. Sta.). (*Jour. Econ. Ent., 31 (1938), No. 3, pp. 385–388, fig. 1*).—Studies commenced in the fall of 1936 of the strawberry crown borer, for the past 40 yr. the worst insect pest of the strawberry in Kentucky, are summarized. It was found in rearing work that there were two generations of the borer in western Kentucky in 1937. The pest appears to be native on common cinquefoil (*Potentilla canadensis*), which abounds in western Kentucky. Much of the crown borer infestation in strawberry patches was traced to nearby cinquefoil. The strawberry crown borer in Kentucky is attacked by several insect parasites and predators. The larvae of *Microbracon analcidis* Ashm. were found parasitizing about 2 percent of the crown borer larvae examined during the season of 1937. One larva of *Hister americanus* Payk. was found at Princeton consuming a large crown borer larva. A number of elaterid larvae were found feeding on crown borer larvae or pupae. Two of these were reared and identified as *Monocrepidius auritus* Herbst.

Bionomic notes on Exartema ferriferanum Walk. (Lepid., Olethreutidae) and its parasites (Hym.: Brac., Chalc.), W. V. BALDUF (*Jour. N. Y. Ent. Soc., 46 (1938), No. 1, pp. 23–26*).—Observations made of some 20 individuals of *E. ferriferanum* attacking the leaves of *Hydrangea* in and near Urbana, Ill., in May and June 1936 are reported.

Tomato pin worm (Gnorimoschema lycopersicella (Busck)) in Florida, G. R. SWANK (*Fla. Ent., 20 (1937), No. 3, pp. 33–42*).—In a study of the biology of the tomato pinworm, conducted at the Florida Experiment Station with materials collected in Osceola, Polk, Orange, and Seminole Counties, its life cycle was found to be completed as soon as 21 days during the month of June. Under favorable conditions parasites become very numerous, and their effect as a check on the number of tomato pinworms is important. The shipment of plants, tomatoes, and shipping containers is the most potent means of spreading the insect from one trucking district to another. The feeding of the larvae is confined to tomato, potato, eggplant, and a few other solanaceous plants. They are unable to complete the life cycle when placed on wild Florida tomato, nightshade, or pepper plants. The necessity for plowing under all material remaining in the field after the crop is harvested in order to reduce the danger of the patch becoming a reservoir for infestation of a nearby or a succeeding crop is emphasized.

Present status of the orange worm problem, A. M. BOYCE. (Calif. Citrus Expt. Sta.). (*Calif. Citrogr., 23 (1938), No. 5, p. 220*).—This brief contribution notes that laboratory toxicity tests of many chemicals and thousands of tortrix larvae, conducted almost continuously since 1934, have resulted in the finding of one compound, namely, cuprous cyanide, which gives promise as a satisfactory substitute for cryolite or barium fluosilicate in its control. In connection with certain of the laboratory toxicity studies it was found that a very high kill of tortrix larvae can be obtained with a pyrethrum-talc dust mixture containing 0.2 percent of pyrethrins.

Orange worms again building up in several citrus districts, A. M. BOYCE (Calif. Citrus Expt. Sta.). (*Citrus Leaves, 18 (1938), No. 2, pp. 3, 33, figs. 2*).—A practical contribution calling attention to the prevalence of the orange tortrix and *Holcocera* sp. in many citrus districts of the State and means for their control.

Status of the European corn borer in 1937, W. A. BAKER and A. M. VANCE (U. S. D. A.) (*Jour. Econ. Ent., 31 (1938), No. 3, pp. 348–353, figs. 2*).—

The present status of the European corn borer in 1937 as compared with the 3 yr. preceding and a summary of data on corn borer infestation in potatoes in New York, Connecticut, and Massachusetts in 1937 are presented in tables. Maps are given showing the status and relative abundance of the pest in the United States in 1937.

Comparative resistance to the European corn borer of two hybrid strains of field corn at Toledo, Ohio, L. H. PATCH, G. T. BOTTGER, and B. A. APP. (U. S. D. A.). (*Jour. Econ. Ent., 31 (1938), No. 3, pp. 337–340*).—In field experiments conducted in 1936 and 1937 at Toledo the top-crossed hybrid field-corn strain Michigan Hybrid No. 561 which has been reported to be resistant to the European corn borer was found not to be relatively borer resistant with respect to the number of mature borers surviving from a given number of eggs; neither was it found to be borer resistant with respect to the deposition of eggs by the moths in nature, nor to the reduction in the yield of grain by a given number of borers compared with the reduction that was expected of strains of equal yielding capacity.

Field status of European corn borer parasites at the close of 1936, W. A. BAKER and W. G. BRADLEY. (U. S. D. A.). (*Jour. Econ. Ent., 31 (1938), No. 3, pp. 345–348*).—The progress of European corn borer parasite control work, releases of imported species of which over the entire infested area have been under way since 1920, is reported upon, the details being given in tables that summarize parasite recovery records made in the Lake States area and in the Eastern States area in the fall of 1936. Practically continuous series of releases of material from Europe have been made since 1920, supplemented since 1928 by parasites from the Orient. The parasites considered are *Lydella stabulans grisescens* R. D., *Inareolata punctoria* Roman, *Chelonus annulipes* Wesm., *Macrocentrus gifuensis* Ashm., and *Cremastus flavoorbitalis* Cam.

Codling moth oviposition and temperature, D. ISELY. (Ark. Expt. Sta.). (*Jour. Econ. Ent., 31 (1938), No. 3, pp. 356–359*).—This contribution relates chiefly to the effect of daily mean temperatures upon oviposition of the codling moth in the apple area of northwestern Arkansas at Fayetteville based upon studies largely of moths of the summer broods in 1936 and 1937. It was found that an increase in temperature, under the usual climatic conditions in this area, tends to increase the daily oviposition of the codling moth. "The optimum temperature for oviposition appears to be 27° C. Excessively high temperature tends to reduce the average number of eggs deposited by moths which continue ovipositing, and abruptly terminates the oviposition period of others. It may also produce sterility of the eggs deposited. The effect of short periods of excessive temperature may not be noticed in the field. Low temperatures retard daily oviposition but prolong the oviposition period of the moths. Low temperatures also cause irregular daily oviposition. The largest total number of eggs was deposited by moths when the mean temperature of the oviposition period was 25°. During midsummer over 90 percent of the eggs [are] deposited during the first 7 days of the oviposition period. In spring the same percentage of oviposition requires 12 days. This information may not be useful in planning a summer spraying schedule but should be useful in interpreting results in experimental work."

The kind of radiation most attractive to the codling moth.—A progress report, G. E. MARSHALL and T. E. HIENTON. (Ind. Expt. Sta.). (*Jour. Econ. Ent., 31 (1938), No. 3, pp. 360–366, figs. 2*).—Comparisons made of the attractiveness of some lamps to the codling moth and radiant intensities of some lamps used in tests, microwatts per square centimeter at 1 m distance, in continuation of those noted (E. S. R., 74, p. 234), are summarized in tables. From the tests conducted the authors conclude that there are three things which influence the

attractiveness of light to the codling moth, namely, intrinsic brilliance, the size of the luminous area, and the color. "Small amounts of ultraviolet, in addition to blue and violet, seem to have little attraction. Large amounts of ultraviolet, based comparatively on the lamps used in the tests, add to the attractiveness of the lamp. It would seem that the best lamp to attract the coddling moth would be one with the right shade of blue, with great intrinsic brilliance, and with a large luminous area. The dark blue 200-w tungsten filament lamp, when all other conditions were equal, showed the greatest attractiveness of all lamps tested."

Experiments with tank-mix nicotine-bentonite-soybean oil for codling moth control, L. F. Steiner and R. F. Sazama. (U. S. D. A.). (*Jour. Econ. Ent., 31 (1938), No. 3, pp. 366–374, fig. 1*).—The results of tests in southern Indiana for codling moth control are summarized in five tables.

"Under Midwest conditions deposits of lead arsenate sufficient for effective control of the codling moth are often more than the apple tree can stand. Extensive tests over a period of 3 yr. have shown that a tank mixture of 1 pt. nicotine sulfate, 5 lb. bentonite, 1 qt. soybean oil, and 0.25 to 0.5 oz. sodium lauryl sulfate per 100 gal. is more effective than any other lead arsenate substitute tested. Combination laboratory-field tests showed that it equaled or was superior in larvicidal efficiency to the heaviest applications of lead arsenate that can be recommended for use in this area. Commercial usage in 1937 on 90 acres in comparison with a heavy lead arsenate and lead arsenate-oil schedule on the remaining 122 acres of a local orchard gave the following results: (1) Equal control of worms on one variety and reduction in worms up to 60 percent on three others; (2) reduction in stings ranging from 88 to 96 percent on all of the varieties; (3) excellent control of leafhoppers with greater early color development on all varieties and less drop of fruit on Jonathan; (4) complete avoidance of spray injury, whereas the lead arsenate schedule caused severe injury followed by a 50 percent June drop of fruit on the Turley variety; (5) residue removal less difficult and less costly (no removal measures were needed on the Transparent, and dry brushing was ample on the Jonathan); (6) its increased cost for materials was more than offset by the increase in uninjured fruit on all except the Turley variety; [and] (7) the high proportion of new entrances in the nicotine sprayed fruit in September indicated that the interval between the last nicotine spray (July 29) and harvest was too long. A nicotine spray was needed early in September. The use of summer oil plus nicotine sulfate for the last two cover sprays will mask and soften the bentonite deposit and in most instances make unnecessary the cleaning of fruit at harvest."

Comparative tests of fixed nicotines and lead arsenate against codling moth, R. Hutson, J. M. Merritt, and F. Parmelee. (Mich. Expt. Sta.). (*Jour. Econ. Ent., 31 (1938), No. 3, pp. 374–378*).—Orchard tests of fixed nicotines and combinations of fixed nicotines with other materials in replicated plats on McIntosh, Northern Spy, and Baldwin apples conducted at Mason, Mich., during 1936 and 1937 are reported. "The controls secured under conditions of moderate to heavy infestation compare favorably with applications of lead arsenate included as a check. The fixed nicotines are increased in effectiveness by the inclusion of oils with them. This is especially true in the combination B. L. 155 plus 2 qt. of summer oil emulsion. Insofar as these experiments are concerned, apple trees are remarkably tolerant of the fixed nicotines."

Experiments in the control of oriental fruit moth with oil dusts, W. P. Flint, M. D. Farrar, and S. C. Chandler. (Ill. Expt. Sta. et al.). (*Jour. Econ. Ent., 31 (1938), No. 3, pp. 380–382*).—The results of the application of oil dusts

in the control of the oriental fruit moth in southern Illinois peach orchards from 1929 to 1937, inclusive, are reported, the details being given in six tables.

Two types of mothproofing solutions, E. A. BACK (*Ent. Soc. Wash. Proc., 39 (1937), No. 9, pp. 269–281, pls. 5*).—Tests conducted by the author are said to have substantiated his earlier reports that aqueous arsenical solutions are of doubtful value as mothproofing agents. Pieces of army suiting that had been treated with a pentachlorodioxytriphenylmethane sulfonic acid solution and were kept from January to December 1937 in an open closet to which insects had access escaped injury. All injury was confined to the untreated fabric.

The introduction into Hawaii from Mexico of insect parasites to control armyworms (1923–1924), H. T. OSBORN (*Hawaii. Planters' Rec. [Hawaii. Sugar Planters' Sta.], 42 (1938), No. 2, pp. 147–152, figs. 2*).—The results of a search for armyworm parasites in Mexico, made by the author, are considered. The discovery of *Euplectrus platyhypenae* and its introduction into Hawaii; notes on the parasite *Apanteles militaris* (Walsh), which was introduced into Hawaii but failed to become established; an unidentified small tachinid, shipments of which to Hawaii failed to survive; and a large tachinid, *Archytas cirphis* Curran, which became established in about 1 year's time following the release of nine individuals and eventually spread to all of the Hawaiian Islands, are included.

Infestation of grasses of the genus Aegilops by the hessian fly, E. T. JONES. (U. S. D. A.). (*Jour. Econ. Ent., 31 (1938), No. 3, pp. 333–337, figs. 2*).—Eighteen strains of grasses were found susceptible to hessian fly infestation during the course of greenhouse tests of 22 strains representing 11 species. Two strains each of *A. ventricosa* and *A. cylindrica* appeared to be resistant to fly infestation. "All strains of *Aegilops* were found to be much less attractive to flies for oviposition than was wheat. Egg counts showed that comparably infested plants of 15 strains of *Aegilops* differed in attractiveness for oviposition, but no outstanding differences between strains were noted. Tests of 9 selections of wheat-*Aegilops* crosses of F_4 and F_6 generations gave infestations of 0 to 100 percent. *A. cylindrica* and *A. ventricosa* are possible sources of resistant parent material for breeding fly-resistant wheat. Susceptible strains of *Aegilops* are potential secondary hosts which may at some future time have to be reckoned with in the prevention of damage by the hessian fly."

Tennessee Valley mosquito collections, S. E. SHIELDS. (U. S. D. A.). (*Jour. Econ. Ent., 31 (1938), No. 3, pp. 426–430*).—An account is given of mosquito collections made in areas surrounding Norris, Guntersville, Wheeler, Wilson, and Pickwick Landing Dams in the Tennessee Valley and, to a lesser extent, in the Great Smoky Mountains and at Reelfoot Lake. Data are given on types of breeding places and periods through which the mosquitoes occurred in cases where records on a species are vague and inadequate.

A method for the sterile culture of houseflies, R. W. GLASER (*Jour. Parasitol., 24 (1938), No. 2, pp. 177–179*).—Description is given of a technic which proved satisfactory in obtaining sterile culture of the housefly.

Fly damage to drying cut fruits, H. C. DONOHUE (*Ent. Soc. Wash. Proc., 39 (1937), No. 9, p. 283*).—The injury resulting from infestation of drying apricots in the northern Sacramento Valley of California, due to the housefly, *Lucilia caeruleiviridis* Macq., *L. sericata* Meig., and *Cryptolucilia caesarion* Meig., is briefly noted.

Screwworm control, W. E. DOVE (*U. S. Dept. Agr. Leaflet 162 (1938), pp. [2]+6, figs. 7*).—A practical account of the screwworm.

Larvae and pupae of tachinids parasitizing Pieris rapae L. and P. brassicae L., G. A. BISSET (*Parasitology, 30 (1938), No. 1, pp. 111–122, figs. 37*).—

The identification and description of the immature forms of tachinid parasites of the imported cabbageworm and of *P. brassicae*, namely, *Phryxe vulgaris* Fall., *P. nemea* Meig., *Epicampocera succincta* Meig., *Compsilura concinnata* Meig., and an unknown species, are taken up.

The annual white grub Ochrosidia villosa Burm. in Ohio lawns, C. R. NEISWANDER. (Ohio Expt. Sta.). (*Jour. Econ. Ent., 31 (1938), No. 3, pp. 340–344, figs. 4*).—A study of the biology and control of *O. villosa*, the white grubs of which have during the past 3 or 4 yr. severely injured lawns in Ohio, is reported upon, the details being given in four tables and two graphs. The application of a carbon disulfide plus rosin fish oil soap emulsion consisting of a stock emulsion (made up of 1 part rosin fish oil soap, 3 parts of water, and 10 parts of carbon disulfide) diluted at the rate of 1 qt. to 50 gal. of water and applied at the rate of 1.5 gal. per square yard gave the highest mortalities. However, the author is inclined to favor the arsenical treatment, consisting of the application of 10 lb. of lead arsenate per 1,000 ft. of soil surface, because of the known residual effect of this treatment.

***Progress report on dusts containing rotenone for the control of flea* beetles attacking shade-grown cigar-wrapper tobaccos,** F. S. CHAMBERLIN and A. H. MADDEN (*Fla. Ent., 20 (1937), No. 2, pp. 25–29, fig. 1*).—Information thus far obtained has shown that dust mixtures containing rotenone have an established value in combating flea beetles (tobacco flea beetle and potato flea beetle) upon shade-grown cigar-wrapper tobacco, particularly the types grown in northern Florida, southern Georgia, and the Connecticut Valley.

In the tests conducted cube dust mixture containing 1 percent of rotenone gave a 74-percent kill of the flea beetles after an exposure of 24 hr. to sunlight, which was about the equivalent of 2 days of cloudless exposure. The dust mixture containing 1.5 percent of rotenone maintained its toxicity much longer than the 0.5 percent material. The information available indicates that the effectiveness of cube dust mixtures containing 1 percent of rotenone is limited to about 3 days under field conditions. It is pointed out that cube is not toxic to grasshoppers and exerts only a very limited control of the tobacco hornworms (*Protoparce* spp.) and the tobacco budworm. It is recommended that for newly set tobacco plants a rotenone dust mixture of 4 or 5 lb. per acre be applied and for the mature crop from 8 to 10 lb. per acre.

Recommendations for control of plum curculio on peach, S. C. CHANDLER (*Jour. Econ. Ent., 31 (1938), No. 3, pp. 378, 379, fig. 1*).—This report is based upon the author's experience in Illinois and communications received from entomologists in 19 other States in the eastern half of the country and in the Province of Ontario.

Susceptibility of unhusked rice (paddy) versus polished rice to rice weevil attack, C. E. PEMBERTON (*Hawaii. Planters' Rec. [Hawaii. Sugar Planters' Sta.], 42 (1938), No. 2, p. 103*).—A test in which three lots of rice were treated to determine their relative resistance to the rice weevil was commenced September 29, 1937. When completed January 14, 1938, jars with husked and polished rice contained no sound grains, jars with husked and unpolished rice contained 76 percent, and jars with unhusked (paddy) rice contained 97.5 percent sound grains.

Crop pests in 1937, J. R. WATSON. (Fla. Expt. Sta.). (*Citrus Indus., 19 (1938), No. 3, pp. 8, 21*).—In this brief account particular mention is made of the white fringed beetle, known to some growers as the Argentine weevil, and the progress of control work inaugurated by the U. S. D. A. Bureau of Entomology and Plant Quarantine in cooperation with State officials, as previously noted (E. S. R., 79, p. 369).

Importance of bees in the production of watermelons, C. C. GOFF (*Fla. Ent., 20 (1937), No. 2, pp. 30, 31*).—It is shown in work in Florida that earliness and size of watermelon yield may be increased by keeping honeybees near the field during the flowering season. In large fields the best results should be obtained by having a hive near the center of the field.

Two new chalcidoid egg parasites (Eulophidae and Mymaridae), A. B. GAHAN (*Ent. Soc. Wash. Proc., 39 (1937), No. 9, pp. 266–269*).—*Tetrastichus silvaticus,* reared from the eggs of the forest tent caterpillar in Minnesota, and *Erythmelus psallidis,* a parasite of the eggs of the cotton flea hopper in Louisiana, South Carolina, Mississippi, Arkansas, Texas, and Arizona, are described as new.

Eupelmella vesicularis Retz. (Chalcididae) as a predator of another chalcid, Microplectron fuscipennis Zett., K. R. S. MORRIS (*Parasitology, 30 (1938), No. 1, pp. 20–32, figs. 5*).—While engaged in a study of the parasites of sawflies in central Europe for the Imperial Institute of Entomology, the author found the widely distributed chalcid parasite *E. vesicularis* to live as a predator upon the larvae of another chalcid (*M. fuscipennis*) that is a primary parasite of the pine sawfly *Diprion sertifer* Geoff. It was never found in the absence of this latter chalcid. The undoubted preference for this host, its biology, and the adaptations of the various stages for this peculiar manner of life are dealt with. It reproduces parthenogenetically, and no males are known.

Biology of the new chalcid parasite Cirrospilus inimicus Gahan, F. L. MARSH (*Jour. N. Y. Ent. Soc., 46 (1938), No. 1, pp. 27–29*).—These notes relate to a secondary parasite of the ichneumonid *Spilocryptus extermatis* Cress., which was found by the author to serve as the principal primary parasite of the cecropia moth in the Chicago area.

Resumé and conclusions to Paul Marchal's extended paper on the Trichogrammas, trans. by L. O. HOWARD (*Ann. Ent. Soc. Amer., 30 (1937), No. 4, pp. 551–557*).—This is a translation of part of the contribution by Marchal previously noted (E. S. R., 78, p. 831).

Tarantula studies, W. J. BAERG (*Jour. N. Y. Ent. Soc., 46 (1938), No. 1, pp. 31–43, figs. 4*).—A further report of studies (E. S. R., 58, p. 855), presented with a list of 13 references to the literature. The contribution pertains to the development, regeneration, food and water requirements, and a method of extracting the poison from *Eurypelma californica* Auss.

The new citrus bud mite, A. M. BOYCE and K. E. MAXWELL. (Calif. Citrus Expt. Sta.). (*Calif. Citrogr., 23 (1938), No. 3, pp. 109, 152, figs. 5*).—The authors report upon the new eriophyid mite described by Ewing (E. S. R., 78, p. 831) as *Eriophyes sheldoni,* the attack of which on lemon trees in Ventura County, Calif., results in abnormalities of foliage and fruit growth. This mite has been found on lemon, orange, and grapefruit, lemon being the preferred host, but its presence thus far on orange and grapefruit has been of slight importance. Agricultural surveys have shown it to occur in Santa Barbara, Ventura, Los Angeles, Orange, and San Diego Counties. Control work has demonstrated that hydrocyanic acid gas fumigation or oil sprays as regularly used for control of the black scale and the citrus red mite are very effective in killing the citrus bud mite.

The scientific name of the common North American chigger preoccupied, H. E. EWING (*Helminthol. Soc. Wash. Proc., 5 (1938), No. 1, pp. 26, 27*).—The name (*Leptus*) *Trombicula irritans* (Riley) for the common North American chigger has been found to be preoccupied. *Trombicula alfreddugèsi* (Oudemans) 1910, becomes the proper scientific name of this pest.

ANIMAL PRODUCTION

The American Society of Animal Production: Record of proceedings of the thirtieth annual meeting, November 26–28, 1937 (*Amer. Soc. Anim. Prod. Proc. 30 (1937), pp. 394, figs. 11*).—This is a report of the annual meeting held at Chicago in 1937 (E. S. R., 77, p. 672). The following papers were presented before the general, dairy cattle, horses and mules, beef cattle, swine, sheep and wool, meats, and nutrition sections:

Determining Net Energy Values by Means of Feeding Experiments, by F. B. Morrison (pp. 12–20); Practical Applications of Productive Energy Values to Problems Concerning Feeds and Feeding, by G. S. Fraps (pp. 20–26); Discussion of the Papers by G. S. Fraps and F. B. Morrison, by E. B. Forbes (pp. 27–29); The Importance of the Relations Between Energy, Protein, and Minerals in Measuring the Nutritive Value of Feeds and Rations, by H. H. Mitchell (pp. 29–42); Relationship of Accessory Factors and Requirements to Feed Values, by H. R. Guilbert and G. H. Hart (pp. 42–48); The Guiding Principles for Nutrition Research, by E. B. Hart (pp. 48–50); Palatability and Nutritive Value of A. I. V.- and Molasses-Alfalfa Silage for Dairy Cows, by G. Bohstedt, I. W. Rupel, W. A. King, W. H. Peterson, and D. M. Hegsted (pp. 51–54); Reproduction on Rations Free From Vitamin E, by B. H. Thomas and C. Y. Cannon (pp. 59–63); Cottonseed Meal as a Feed for Ponies, by M. G. Snell (pp. 70–73); Facts College Men Should Consider About Horses and Mules, by W. Dinsmore (pp. 74–78); Live Weight Gains as a Measure of Pasture Fields, by R. B. Hinman (pp. 83, 84); Utilizing Bluestem Grass in Fattening Young Cattle for Market, by C. W. McCampbell, B. M. Anderson, H. E. Reed, and A. D. Weber (pp. 84–90); Sudan for Summer Pasture, by W. H. Peters (pp. 90, 91); Further Studies on the Use of Alfalfa Pasture in the Production of Finished Yearlings, by M. L. Baker (p. 92); The Phosphorus Requirements of Beef Cattle, by W. M. Beeson, D. W. Bolin, and C. W. Hickman (pp. 92–95); Some Factors Affecting the Length of Time Whole Corn Kernels Are Retained in the Rumens of Steers, by C. H. Kick, P. Gerlaugh, and A. F. Schalk (pp. 95–97); The Utilization of Blackstrap Molasses With Corn and Oats in Fattening Steer Calves, by W. L. Blizzard and B. R. Taylor (pp. 98–101); Influence of Type and Sex on the Body Measurements of Shorthorn Calves, by W. H. Black and B. Knapp, Jr. (pp. 101–106); Soybean Oil Meal and Other Plant Protein Rations for Pigs, Supplemented With Limestone and Bone Meal, by G. Bohstedt, J. M. Fargo, and W. A. King (pp. 107–110); Yeast Feeds for Fattening Pigs in Dry Lot, by W. J. Loeffel (pp. 110–113); Blackstrap Molasses as a Substitute for Corn in Fattening Rations, by C. P. Thompson (pp. 113–115); The Relation of Hominy Feed to the Production of Soft Pork, by J. R. Wiley, C. M. Vestal, and C. L. Shrewsbury (pp. 115–121); The Significance of Weight Changes in Sows During the Gestation and Suckling Periods, by J. H. Zeller, T. G. Johnson, and W. A. Craft (pp. 121–126); Adjusting Weights of Pigs to a Standard Age of 56 Days, by J. A. Whatley, Jr. and E. L. Quaife (pp. 126–130); Pastures for Hogs, by E. J. Wilford (pp. 130–133); The Degree to Which Litter Size Is a Constant Characteristic of Sows, by J. L. Lush and A. E. Molln (pp. 133–137); The Effect of Molasses on the Digestibility of a Lamb Fattening Ration, by H. M. Briggs (pp. 145–149); Recent Developments in Lamb Feeding, by R. F. Cox and F. A. Wagner (pp. 149–152); The Paired-Method in Sheep Feeding Studies, by T. B. Keith and W. L. Henning (pp. 152–156); *Sericea lespedeza* for Fattening Lambs, by F. R. Edwards (pp. 156–158); Shearing Sheep Once vs. Twice a Year, by J. M. Jones, S. P. Davis, and W. H. Dameron (pp. 158–164); Wool Shrinkage and Its Importance to Range Sheepmen, by R. H. Burns (pp. 164–171); Report of the Committee Appointed to

Review Researches on the Quality and Palatability of Meats, by W. C. Coffey (pp. 239–241); Some Relationships Between Back-Fat Measurements and Weight, Firmness, and Other Characteristics of Hog Carcasses, by N. R. Ellis and O. G. Hankins (pp. 242–246); A Study of the Factors Influencing Tenderness and Texture of Beef, by D. E. Brady (pp. 246–250); A Study of Salt Penetration in Curing Lamb Legs, by A. K. Besley and R. L. Hiner (pp. 250–254); A Progress Report on the Meat Yields of Danish Landrace Hogs in Comparison With Certain American Breeds, by O. G. Hankins and R. L. Hiner (pp. 255–259); Studies on the Effects of a Bovine-Blindness-Producing Ration Upon Rabbits, by P. H. Phillips and G. Bohstedt (pp. 324, 325); Studies of the Nutritive Requirements of Sheep by the Synthetic Diet Method, by C. M. McCay and R. A. Rasmussen (pp. 326–333); The Effect on Growing Pigs of Rations Containing Different Levels of Phosphorus in the Absence of Vitamin D, by C. E. Aubel and J. S. Hughes (pp. 334–340); Phosphorus Deficiency in Cattle as a Result of Conditions Other Than Low Phosphorus Content of the Soil and of the Feeding Stuffs Grown Thereon, by E. B. Forbes and S. R. Johnson (pp. 340–344); The Phosphorus Requirements of Sheep, by W. M. Beeson, D. W. Bolin, and C. W. Hickman (pp. 345–350); The Relations of the Lignin and Cellulose Content of Pasture Herbage to Its Nutritive Value, by E. W. Crampton (p. 351); Report of the Fourth International Grasslands Congress of 1937, by R. H. Lush (pp. 351–354); and Electric Quick Drier for Moisture Determinations, by R. H. Reed (pp. 354–361).

Tests of significance in reversal or switchback trials, A. E. Brandt (*Iowa Sta. Res. Bul. 234 (1938), pp. 57–87*).—The author proposes two statistical tests of significance adapted to the results of reversal or switch-back trials. One is a modification of "Student's" t-test and the other a method of analysis of variance. Identical results may be obtained by either method when but one attribute of the experimental units is measured, but when one or more other measures relevant to the experimental results are to be examined through the use of covariance the latter method must be used.

Bibliography on the influence of mineral deficiencies on growth and reproduction of farm animals, M. E. Whalley (*Ottawa: Natl. Res. Council, Canada, 1937, pp. [1]+89*).—This comprehensive bibliography contains 987 references.

Livestock judging handbook, J. E. Nordby and W. M. Beeson (*Danville, Ill.: Interstate Prtrs. and Pubs., 1937, pp. 288, figs. 202*).—A brief, practical, and well illustrated manual on judging beef cattle, draft horses and mules, sheep, and swine.

[Livestock investigations in Indiana] (*Indiana Sta. Rpt. 1937, pp. 28–34, 72–75, 81, figs. 4*).—Brief reports are presented for the following investigations: Cane molasses for beef cattle and factors affecting the production of native calves, both by F. G. King; full feeding v. intermediate feeding of protein supplements to hogs on pasture and processed soybeans in the brood sow and pig rations, both by C. M. Vestal; the effects of soybeans and soybean products and of hominy feed on the quality of pork, the nutritive value and mineral deficiencies of soybeans and soybean products, and the expeller-process v. solvent-process soybean meal for hogs, all by Vestal and C. L. Shrewsbury; the effects of farm rations on the firmness of hog carcasses, warm grade and chilled grade as measures of hog carcass quality, and the shrinkage, fill, and yield of market hogs, all by J. R. Wiley; the value of tankage, molasses, and limestone and bonemeal as components in lamb-fattening rations, and the role of legume hay in lamb production, all by C. Harper.

Poultry studies include the heritability of growth rate in chickens, by E. E. Schnetzler; reducing protein in chick rations, oats as a substitute for corn in

broiler rations, and the importance of salt in broiler rations, all by R. E. Roberts and C. W. Carrick; whole wheat v. corn as scratch grains for layers, roasted soybeans in laying rations, and range v. confinement for layers, all by Carrick; a comparison of the various types of laying houses, by Carrick and I. D. Mayer; starting and growing rations for turkeys, by Roberts; and poultry management studies at the Moses Fell Annex Farm.

[Livestock investigations in Ohio] (*Ohio Sta. Bul. 592 (1938), pp. 93–102, 103–105, 125, 126*).—Brief reports of experiments with beef cattle by P. Gerlaugh, H. W. Rogers, C. W. Gay, C. H. Kick, A. J. Schalk, and E. A. Silver include protein requirements of fattening cattle on a high corn silage ration, the effect of decreasing corn and increasing the legume hay in the ration of fattening steers, optimum protein levels for fattening steers on a mixed hay, silage, and shelled corn ration, and the effect of mechanical processing of feed on mastication and rumination by steers.

Swine tests reported include the desirability of self-feeding the supplement when ear corn is fed twice daily to pigs on pasture, the value of adding ferrous sulfate to cottonseed meal for pigs, toasted solvent soybean oil meal for pigs, hydraulic v. expeller soybean oil meal for pigs, the value of dried skim milk for young and older pigs, and ground v. whole oats for growing and fattening swine, all by W. L. Robison; and the performance of purebred v. cross-bred hogs, by M. A. Bachtell. From sheep studies by D. S. Bell, Kick, and L. E. Thatcher results are noted on timothy hay and other nonleguminous roughages in rations for ewes and lambs, corn silage as the sole roughage for ewes and fattening lambs, and factors influencing the feed lot performance of western lambs. Reports of nutrition experiments by R. M. Bethke, P. R. Record, O. H. M. Wilder, V. D. Chamberlin, C. H. Hunt, and H. F. Winter include the riboflavine (vitamin G) requirement of the chicken and the effects of various levels of this substance in poultry rations, the stability of carotene and vitamin A in a mixed ration, the vitamin A requirements of laying hens, feeding the various fractions in the vitamin B group and the loss of carotene in dehydrated alfalfa leaf meal under storage conditions. Other poultry studies include the ration as affected by free-choice feeding of whole grain and mash, laying batteries v. floor pens for layers, and livability and egg production of pullets as affected by previous management, all by D. C. Kennard and Chamberlin.

[Livestock and poultry investigations in Wisconsin] (*Wisconsin Sta. Bul. 440 (1938), pp. 1–10, 11, 12, 13–17, figs. 12*).—Continuing the 1937 annual report (E. S. R., 78, p. 833), brief results are presented by G. Bohstedt, I. W. Rupel, J. M. Fargo, W. A. King, B. H. Roche, J. G. Halpin, C. E. Holmes, and J. B. Christiansen on the use of alfalfa silage for milking cows; the use of skim milk, whey, and cheese meal for bred gilts; the value of molasses in swine rations; the use of soybean oil meal for pigs and suitable minerals to feed with soybean oil meal; nutritional diseases of chicks; suitable rations for sustained yield of fertile eggs by old heavy hens; the cod-liver oil requirements of laying pullets; the use of soybean oil meal in the ration of chicks and laying hens, the comparative gains of caponized and normal males, and economical rations for turkeys and pheasants.

The relation of cellulose and lignin content to the nutritive value of animal feeds, E. W. Crampton and L. A. Maynard (*Jour. Nutr., 15 (1938), No. 4, pp. 383–395*).—The authors discuss the chemical and biological nature of lignins, cellulose, and hemicellulose in plant material and indicate the limitations of the present general practice of merely partitioning the carbohydrates in animal feeds into crude fiber and nitrogen-free extract. Chemical methods

are proposed for the determination of lignin and cellulose in feeds and feces. Digestion trials with rabbits and with steers, in which the carbohydrates of the feed and feces were partitioned, first, into crude fiber and nitrogen-free extract, and, second, into lignin, cellulose, and other carbohydrates, indicated that the latter values may have more biological significance and hence be of greater value in predicting feeding values.

The relation of the "grass juice factor" to guinea pig nutrition, G. O. Kohler, C. A. Elvehjem, and E. B. Hart (*Jour. Nutr., 15 (1938), No. 5, pp. 445–459, figs. 5*).—In further studies at this laboratory (E. S. R., 78, p. 527), young guinea pigs fed a diet of whole milk produced under winter conditions and supplemented with iron, copper, and manganese lost weight rapidly during the fourth to seventh weeks of the test, developed respiratory troubles, and showed clonic contractions of the legs immediately preceding death. Orange juice, brewers' yeast, and liver extract as supplements to this diet had little or no beneficial effect. Small supplements of various grasses supplied a factor (or factors) which permitted guinea pigs on the winter mineralized milk diet to grow normally. Centrifuged grass juices contained the active principle, which was fairly stable at low temperatures but disappeared rapidly when stored at room temperature and was largely destroyed by autoclaving. Since this type of basal diet supported slow growth in rats but resulted in the death of guinea pigs, the latter species appeared to be good experimental subjects for studies on the grass juice factor.

Studies on the effects of a bovine blindness-producing ration upon rabbits, P. H. Phillips and G. Bohstedt. (Wis. Expt. Sta.). (*Jour. Nutr., 15 (1938), No. 3, pp. 309–319, figs. 3*).—A ration which had caused stenosis of the optic foramen in calves did not produce stenosis in the rabbit but did result in a syndrome otherwise similar to that produced in calves and characterized by retarded growth, ataxia and loss of equilibrium, and eye disorders terminating in opacity and blindness. Administering 50 μg of carotene daily per kilogram of body weight afforded protection against this syndrome and maintained the health of the animals. Wesson oil, aerated cod-liver oil, and a flavine concentrate in the diet were without preventive or remedial effect. Once the disorder had developed, from 30 to 70 μg of carotene daily per kilogram of body weight were without remedial effect, but massive doses of cod-liver oil effected a recovery. One hundred percent mortality occurred unless a source of vitamin A was supplied. Apparently vitamin A deficiency in the diet was the primary cause of the disorder observed.

The cobalt content of some Nelson pastures, H. O. Askew and P. W. Maunsell (*New Zeal. Jour. Sci. and Technol., 19 (1937), No. 6, pp. 337–342*).—Data are presented on the cobalt content of several pastures in the Nelson, New Zealand, area, sampled periodically during the season. These pastures averaged much higher in cobalt than those of the Glenhope area associated with bush sickness. Top dressing pastures with cobalt chloride materially increased the cobalt content of the herbage.

Magnesium—an indispensable element in nutrition: The evidence, B. W. Fairbanks (*North Amer. Vet., 18 (1937), No. 11, pp. 50–52, 53*).—The literature dealing with the effects of a magnesium deficiency in the animal diet is briefly reviewed.

[A new toxicant occurring naturally in certain samples of plant foodstuffs.—XVIII], A study of the toxicity and selenium content of seleniferous diets: With statistical consideration, K. W. Franke and E. P. Painter (*Cereal Chem., 15 (1938), No. 1, pp. 1–24, figs. 3*).—In a further report (E. S. R., 78, p. 394) the results of numerous rat-feeding trials, involving a total of 38

seleniferous diets and 382 experimental animals, are summarized. The sources of selenium in the various rations include sodium selenite, sodium selenate, and that naturally occurring in wheat, corn, barley, and emmer.

A high degree of correlation was found between the toxicity and the selenium content of the various rations, although selenium from different sources varied in toxicity. Considering selenium as the sole toxicant in the cereals fed, the relative toxicity of this element in the different diets ranked in the following order: Wheat, corn, barley, selenate, and selenite. Over 10 p. p. m. of naturally occurring selenium in the diets invariably resulted in pronounced restriction of food consumption, and in practically all cases 9 p. p. m. caused death in the young animals. A concentration of less than 5 p. p. m. prevented normal growth, and the gain per gram of diet consumed was less on seleniferous than on normal diets. Females were slightly less susceptible to selenium poisoning than males, and the toxic effect seemed to depend more on the concentration of selenium in the diet than on the amount actually ingested daily. There was some evidence that the toxicity of grains decreased during prolonged storage.

The biological assay of the carbohydrate metabolism hormone of the anterior pituitary, A. J. BERGMAN, C. W. TURNER, and P. T. CUPPS. (Mo. Expt. Sta.). (*Jour. Biol. Chem., 123 (1938), No. 2, pp. 471–477*).—Experiments gave evidence that extracts of pituitary gland contained a factor which would cause a rapid elevation in the level of blood glucose of well nourished guinea pigs. For assay purposes a guinea pig unit is tentatively proposed, which is the minimum amount of extract injected intraperitoneally into well nourished male guinea pigs weighing from 180 to 220 g that will cause after 8 hr. an average increase of 50 percent in the blood sugar of five or more test animals. Sheep and cattle pituitaries extracted in 60 percent alcohol at a pH of 9 to 10 contained about 250 units of carbohydrate metabolism hormone per gram of dried extract.

The nutritive values of some forage crops of Puerto Rico.—I, Grasses, J. H. AXTMAYER, C. F. ASENJO, and D. H. COOK (*Jour. Agr. Univ. Puerto Rico [Col. Sta.], 22 (1938), No. 2, pp. 95–121*).—Employing the method of Sotola (E. S. R., 62, p. 657), 20 metabolism experiments with sheep were conducted to determine the digestibility and biological value of 5 native grasses, elephant grass, Guinea grass, Malojillo grass, Guatemala grass, and Para grass, cut at different periods. The data are reported in detail.

The biological value of the proteins ranged from 97 for 1 sample of Para grass to 69 for 1 of elephant grass, with most samples falling in the range of from 80 to 90. All grasses tended to give wide nutritive ratios, with second cutting Yaragua and Para grasses particularly wide. These latter two were also relatively low in apparent digestibility. First cuttings of grasses were generally higher in protein and fat and lower in nitrogen-free extracts from second cuttings. The addition of phosphate fertilizer had little influence on the nutritive indexes of the grasses. The vitamin A content of the leaves of the grasses is reported.

[**The nutritive value of grasses and legumes in Puerto Rico**], J. H. AXTMAYER, C. F. ASENJO, and D. H. COOK (*Puerto Rico Col. Sta. Rpt. 1937, pp. 73, 74*).—Results are briefly noted on the composition, apparent digestibility, and biological value of certain native grasses and legumes.

A trial with temporary silos, W. E. KRAUSS, C. C. HAYDEN, A. E. PERKINS, and R. G. WASHBURN (*Ohio Sta. Bimo. Bul. 192 (1938), pp. 71–76, fig. 1*).—Using a small snow-fence type of temporary silos, second-cutting alfalfa was ensiled with no treatment and with additions of mineral acids and of molasses. After 10 to 15 weeks the silos were opened and the silage examined and fed.

Edge and top spoilage was excessive in all lots, the percentage loss of dry weight amounting to 49.5, 68.1, and 83.2 in the untreated, molasses-treated, and

acid-treated lots, respectively. The acid treatment caused excessive damage to the paper silo lining, permitting much exposure to air.

The carotene content and feeding quality of the unspoiled silage was similar to those of comparable silages made in permanent silos. It appeared that legume silage should not be kept in temporary silos too long in hot weather and that these silos are best adapted for storing a late crop for feeding in the fall or early winter to extend the use of a permanent silo.

A critical evaluation of the rat-growth method for determining vitamin B and its content in meals from certain oily seeds, F. W. Sherwood and J. O. Halverson. (N. C. Expt. Sta.). (*Jour. Agr. Res.* [*U. S.*], *56* (*1938*), *No. 12, pp. 927–934, figs. 2*).—A total of 20 samples of soybean meal, peanut meal, cottonseed meal, linseed meal, cottonseed flour, and raw peanuts assayed by the rat-growth method was found to contain from 1.1 to 5.4 International Units of vitamin B per gram. No vitamin B could be detected in cottonseed hull bran. A statistical analysis of the results indicated that a 7-day feeding period was not long enough for most accurate results, and there was no advantage in continuing the assay longer than 3 weeks. The relation between daily dose and total gain was linear when the dosage of vitamin B was held between 0.6 and 1.4 I. U. per day, and under these conditions no sex difference in growth response was noted. The vitamin B requirement for growth was less for spring and early summer than in late summer and autumn.

Commercial feeding stuffs, L. S. Walker, E. F. Boyce, and L. E. Davis (*Vermont Sta. Bul. 436* (*1938*), *pp. 42*).—This is the usual report of the analyses for protein, fat, and fiber of 2,267 samples of feeding stuffs collected for official inspection during December 1937 (E. S. R., 79, p. 89).

Sugar beet tops, cottonseed cake, and mono-calcium phosphate in rations for steers, A. S. Ingraham (*Wyoming Sta. Bul. 227* (*1938*), *pp. 20*).—A series of steer-feeding tests was conducted to determine the value of beet tops when pastured and when fed cured in dry lot, the advantages of feeding barley and alfalfa while pasturing beet tops, and the value of cottonseed cake and monocalcium phosphate in the standard sugar byproduct ration. Beet tops were pastured for from 43 to 49 days, and the total feeding periods covered approximately 160 days.

The tops from 1 acre of beets producing 17 tons provided sufficient pasture for 148 steers for 1 day. Based on the cost of producing gains in dry lot at prevailing feed prices, the tops from 1 ton of beets pastured by steers without other feed were worth $1.16. Supplementing beet top pasture with either alfalfa or barley, or both, slightly improved the rate of gain but increased the cost. Feeding cured tops in dry lot, while less subject to wide variation in returns than pasturing tops, did not offer the opportunity for securing as high net returns as the pasture method. The use of monocalcium phosphate did not appear warranted in these tests, but it is suggested that such additions are cheap insurance against possible phosphorus deficiency. Cottonseed cake, while producing a slight increase in rate of gain, was not a profitable addition to the standard sugar byproduct ration.

Quantity of protein for yearling steers on a heavy silage ration, Madison County, 1936–1937, P. Gerlaugh and H. W. Rogers (*Ohio Sta. Bimo. Bul. 192* (*1938*), *pp. 87, 88*).—A trial in which two groups of yearling steers were full fed on drought-damaged corn silage and legume hay with one lot receiving 2 lb. per head daily of a mixture of finely ground shelled corn, soybean oil meal, cottonseed meal, and tankage (4:2:1:1) and the other 2 lb. of a mixture of soybean oil meal, cottonseed meal, and tankage (2:1:1) gave evidence that these supplements were of practically equal value in terms of gain and finish produced over a fattening period of 182 days.

Reducing the amount of corn and increasing the amount of legume hay in rations for fattening yearling steers, II, P. GERLAUGH and C. W. GAY (*Ohio Sta. Bimo. Bul. 192 (1938), pp. 86, 87*).—This test was a repetition of one previously reported (E. S. R., 77, p. 525). The average daily gains per steer were 1.85, 1.76, and 1.75 lb., the average feeding cost per hundredweight of gain was $18.26, $18.38, and $16.82, and the market appraisal of the cattle was $18.50, $18.50, and $17.75 for the full grain fed, three-fourths full fed, and one-half full fed groups, respectively. The saving in cost of gains in the latter group was not sufficient to overcome the handicap in selling price, and there was also less gain on the hogs following cattle in this group.

Fattening steer calves.—III, Quantity of supplement, P. GERLAUGH (*Ohio Sta. Bimo. Bul. 192 (1938), pp. 77, 78*).—The third trial in this series (E. S. R., 77, p. 525) followed essentially the same plan as earlier trials except that the feeding of 0.8 lb. of the mixed supplement was discontinued. The results obtained substantiate previous findings.

Fattening steer calves—quantity of supplement test.—Summary of three years, P. GERLAUGH (*Ohio Sta. Bimo. Bul. 192 (1938), pp. 79–85*).—A summary of the results of three trials shows that 0.8 lb. per head daily of a mixed supplement containing 45 percent protein throughout the fattening period of steer calves was inadequate for satisfactory gains or finish, that 1.6 lb. per head daily was a safe and satisfactory amount to use, and that 2.4 lb. per head daily could be counted on to produce fatter calves in a feeding period of 6 mo. or longer than would be obtained with 1.6 lb., although the gains will ordinarily cost somewhat more. Starting with a high rate of supplement feeding and reducing the amount as the feeding period advanced was a doubtful procedure. Starting at a low level and increasing the supplement as the feeding period advanced produced calves of excellent appearance, well adapted for a show ring, but for commercial feeding starting at a higher level is recommended.

Fattening native feeder lambs: The effect of shearing in summer, C. HARPER (*Indiana Sta. Bul. 427 (1938), pp. 8, fig. 1*).—Experiments over 3 yr. comparing the rate and economy of gain showed a consistent advantage for the sheared groups. The sheared lambs maintained a better appetite, made slightly greater average daily gains, required less feed (both concentrates and roughage) per unit of gain, and yielded about 21 percent more profit per lamb than the unshorn ones. It was necessary to protect the sheared lambs from flies for 2 to 3 weeks after shearing, and the short staple wool obtained was relatively low in value compared with wool 2 in. or more in length.

The value of cobalt salts for pasture top-dressing in the treatment of stock ailment at Glenhope, Nelson, and Morton Mains, Southland, H. O. ASKEW and J. K. DIXON (*New Zeal. Jour. Sci. and Technol., 19 (1937), No. 5, pp. 317–325, figs. 3*).—Results of a further study (E. S. R., 78, p. 231) showed that a top dressing of only 2 lb. of cobalt chloride per acre significantly increased the cobalt content of the herbage and that sheep suffering from bush sickness lost all symptoms of this ailment when grazed on pastures treated in this manner. Another trial indicated that a top dressing of 10 lb. of cobalt chloride per acre to pasture was a very effective means of overcoming Mortons Mains disease of sheep.

The value of nickel salts in the treatment of Morton Mains ailment, J. K. DIXON (*New Zeal. Jour. Sci. and Technol., 19 (1937), No. 5, pp. 326–329, fig. 1*).—Further trials (E. S. R., 79, p. 232) indicated that the administration once weekly of a drench containing 0.8 mg of cobalt chloride and 0.16 mg of nickel was more effective than a drench containing only 0.8 mg of cobalt.

Angora wool production, W. C. THOMPSON (*New Jersey Stas. Hints to Poultrymen, 25 (1938), No. 4, pp. 4, fig. 1*).—The feeding and management of Angora rabbits for wool production are discussed.

Comparison of protein supplements for fattening pigs, J. E. Foster and E. H. Hostetler (*North Carolina Sta. Tech. Bul. 56 (1938), pp. 84, figs. 2*).—The series of investigations reported was for the purpose of comparing plain dried menhaden fish meal alone, as a supplement to corn and a mineral mixture for fattening pigs, with other protein supplements of animal and plant origin, either alone or in combination with fish meal, and with special reference to the maximum amount of cottonseed meal which could be used satisfactorily in the protein supplement mixtures. All lots of pigs were self-fed free choice and with two exceptions were confined in dry lot throughout the trial.

A supplement of equal parts of cottonseed meal and fish meal promoted more rapid and more economical gains than fish meal alone or mixtures containing larger proportions of cottonseed meal. Pigs which had been on pasture to 75 to 100 lb. suffered no harmful effects when fed supplements containing a high percentage of cottonseed meal during the fattening period. A supplement of equal parts of soybean oil meal and fish meal promoted more rapid gains than either ingredient alone or a mixture of soybean oil meal, cottonseed meal, and fish meal 1:1:1. Soybean oil meal alone was consumed in amounts far in excess of the pigs' protein requirement. Peanut meal was less effective than fish meal and was consumed in excessive amounts. No advantage was obtained from replacing one-fourth of the fish meal with either ground soybean or ground alfalfa hay. Crab meal alone was not a satisfactory supplement and gave best results when comprising only one-fourth of the protein concentrate. Low grade tankage (40 percent protein) was inferior to fish meal when each was combined with equal parts of cottonseed meal. High grade tankage and fish meal 1:1 produced slightly slower gains than fish meal alone but reduced the feed requirement per unit of gain. Whale meal was relatively unsatisfactory as a substitute for fish meal.

Herring meal and fish meal were of approximately equal value in rate of gain produced, and less feed was required per unit of gain on the former. All factors considered, mixtures of fish meal and cottonseed meal 1:1, fish meal and soybean oil meal 1:1, or fish meal, cottonseed meal, and soybean oil meal 1:1:1 were considered most satisfactory supplements to corn and minerals for fattening pigs in dry lot.

Skimmed milk and dried skimmed milk for pigs, W. L. Robinson (*Ohio Sta. Bimo. Bul. 192 (1938), pp. 89–97*).—The results of a number of feeding trials with growing and fattening pigs, using skim milk and dried skim milk with various combinations of feeds, are summarized.

The need of a calcium supplement when skim milk and corn were fed in dry lot was demonstrated. As a supplement to corn for pigs in dry lot skim milk proved to be worth approximately one-tenth as much per pound as tankage and for pigs on pasture about one-fourteenth that of tankage per pound. Skim milk showed greater worth when fed in combination with other high protein feeds than when used as the sole protein concentrate. Dried skim milk fed in combination with tankage and linseed oil meal increased the gains produced per unit of feed consumed and also the rapidity of gains during the growing period over that secured with a tankage and linseed oil meal mixture. Feeding a liberal amount of dried skim milk during the growing period and none during fattening was preferable to feeding a lesser amount throughout the feeding period.

The feeding of yeast, B. W. Fairbanks (*North Amer. Vet., 18 (1937), No. 12, pp. 42–45*).—A review of the literature relating to the value of yeast in swine rations led to the conclusion that there is no evidence that fermenting soaked rations by the addition of yeast is of any value in feeding swine.

The effect of confinement on suckling pigs and its influence on the hemoglobin content of their blood, C. M. Vestal and L. P. Doyle (*Indiana Sta. Bul. 426 (1938), pp. 18, figs. 2*).—Experiments were conducted over a period of 4 yr. in which 45 gilts with their spring litters of pigs were moved to individual houses on sod within 1 week after farrowing, and 41 gilts with their litters were confined in a central house for 28 days after farrowing. Death losses of pigs to weaning age (56 days) were 12.43 and 24.34 percent, and average weights at weaning time were 154.4 and 107.1 lb. for the outside and confined groups, respectively. The two groups showed a similar hemoglobin content of the blood at birth and at 7 days, but at the end of 28 days the outside group had over twice as much hemoglobin per 100 cc of blood as the confined pigs. Outward symptoms of anemia disappeared rapidly when the confined pigs were moved outdoors, but lasting damage was evidently present in many of them.

Comparative value of mature sows and gilts for producing market hogs, E. Z. Russell and R. E. Hutton. (Coop. Mont. Expt. Sta.). (*U. S. Dept. Agr. Circ. 472 (1938), pp. 22, figs. 8*).—Experiments were conducted at two field stations over a period of 8 yr. to determine the comparative value of mature sows, gilts from sows, and gilts from gilts, all of Duroc-Jersey breeding, for the production of market hogs. Pigs farrowed by gilts were consistently raised to a marketable weight more economically than those farrowed by mature sows. The gilts required less feed during the gestation period, and their pigs made more economical gains during the suckling and fattening periods. Both groups of gilts showed a decided advantage in the percentage of pigs raised to weaning and marketing age, although mature sows farrowed larger litters. Mature sows were better sucklers, as evidenced by heavier weaning weight of their pigs.

In economy of production and in percentage of pigs raised, gilts from sows were slightly superior to gilts from gilts. An advantage of producing market pigs from gilts is that those individuals which do not prove to be sure breeders can be sold to good advantage as butcher hogs.

Swine production in Kansas, C. E. Aubel (*Kansas Sta. Bul. 277 (1938), pp. 74, figs. 51*).—This is a handbook on practical swine management. The principal topics of discussion are types and breeds of swine, principles of feeding, management of the breeding herd, pastures for hogs, shelter and equipment for swine, and sanitation.

New Jersey poultry rations, C. S. Platt (*New Jersey Stas. Bul. 645 (1938), pp. 8, figs. 3*).—Practical rations and feeding methods are outlined for baby chicks, broilers, roasters, pullets from 10 to 20 weeks of age, producing pullets, and laying stock for the production of hatching eggs.

The use of cottonseed meal in the chick starting ration, R. C. Ringrose and C. L. Morgan. (S. C. Expt. Sta.). (*Poultry Sci., 17 (1938), No. 2, pp. 109–113*).—In the first of two series of experiments in which the control ration consisted of a mixture of yellow corn meal, wheat middlings, meat scrap, dried whey, alfalfa meal, cod-liver oil, and salt, replacing one-fourth, one-half, and three-fourths of the meat scrap protein with prime quality cottonseed meal gave equally as good growth of chicks to 8 weeks of age as was obtained in the control lot. In the second series, a mixture containing equal parts of protein from meat scrap and cottonseed meal, with 5 percent of alfalfa meal as a source of riboflavine, gave equally as good growth as similar mixtures containing in addition 2, 4, 6, and 8 percent of dried whey as an additional source of riboflavine. Growth on the basal ration with neither alfalfa meal nor dried whey indicated that the supply of meat scrap was relatively potent in this factor.

Studies on the vitamin B_1 requirements of growing chicks, A. Arnold and C. A. Elvehjem. (Wis. Expt. Sta.). (*Jour. Nutr., 15 (1938), No. 4, pp. 403–410,*

figs. 3).—Trials employing the autoclaved natural grain basal diet No. 242A (E. S. R., 74, p. 378) showed that the vitamin B_1 requirement of growing chicks as measured by the prophylactic technic was remarkably constant, averaging from 20 to 25 international units per 100 g of the basal diet. Two samples of crystalline synthetic vitamin B_1 hydrochloride varied in antineuritic potency, 60 μg of one and 80 μg of the other per 100 g of the diet being required to protect the chicks from polyneuritis.

The quantitative vitamin-G requirement of chicks, G. F. Heuser, H. S. Wilgus, and L. C. Norris (*Poultry Sci., 17 (1938), No. 2, pp. 105–108, figs. 2*).—In further investigations (E. S. R., 76, p. 378), it is shown that during the first 8 weeks of life of White Leghorn chicks there exists a fairly close relationship between the number of units of vitamin G per gram of gain, units of vitamin G per gram of weight, ratio of body-mass to gain, units of vitamin G per 100 g of feed, and the instantaneous rate of gain. By providing five groups of normally growing chicks with different levels of vitamin G from 2 to 8 weeks of age, it was found that the amount of this factor necessary for continued normal growth was 350, 290, 240, 200, 160, 130, and 100 units per 100 g of ration for the second to eighth week, respectively. An increasing total number of units of vitamin G per chick per week was required until 5 weeks of age, followed by a gradual decrease in total weekly requirement to 8 weeks. The vitamin G requirement for growth was much greater than for maintenance; also more vitamin G per unit of gain was required when chicks were growing rapidly.

Menhaden fish oil as a source of vitamin D for growing chicks, J. O. Halverson, F. H. Smith, F. W. Sherwood, and R. S. Dearstyne (*North Carolina Sta. Tech. Bul. 57 (1938), pp. 31, figs. 8*).—A series of four experiments, three of which were with small groups of chicks in small thermostatically controlled starting batteries and the fourth of which was with a larger number of chicks in a compartment brooder house, gave evidence that from ½ to 1 percent of good quality commercial menhaden fish oil supplied an adequate amount of vitamin D for the normal growth and skeletal development of chicks. The results were measured in terms of weekly and total gains in weight, the extent of bone calcification, and the total ash and calcium content of representative bones. One-fourth of 1 percent of menhaden oil proved inadequate in vitamin D, while a similar amount of cod-liver oil produced normal calcification. Yellow corn (30 percent of mixtures) supplied the chief amount of vitamin A in the starting ration, which proved ample for normal growth.

Broiler feeding experiments, A. E. Tomhave (*Delaware Sta. Bul. 210 (1938), pp. 20, figs. 3*).—November-hatched cross-bred chicks (Barred Plymouth Rocks X Rhode Island Reds) were used. The final average weight of the broilers at 11 weeks of age was in direct relationship to the level of protein in the ration, being lowest at 16 percent and with only slight differences in average weight of birds on the 18, 20, and 22 percent protein levels. The feed required to produce 1 lb. of gain for the 11-week period was 3.78, 3.63, 3.6, and 3.69 lb. on these respective levels. As the broilers increased in age and weight the efficiency of the feed in producing a unit of gain decreased. When an 18 percent protein ration was fed the highest cash returns over cost of production and the lowest cost per pound of broiler was obtained when all birds were fed throughout a 14-week period. Feeding a dry fattener mash in place of the regular broiler mash during the last 8 days of the feeding period decreased gains, required more feed per unit of gain, and failed to improve pigmentation or fleshing of the birds.

Ranges for the laying flock, L. N. Berry (*New Mexico Sta. Bul. 255 (1938), pp. 15, figs. 3*).—A test extending over an entire laying year was conducted to

compare the value of alfalfa range, a combination of winter wheat and Sudan grass range, fresh-cut alfalfa fed in dry lot, and a combination of cod-liver oil, dried buttermilk, and alfalfa leaf meal without green feed as supplements in the ration of laying pullets. The largest returns over feed cost were received when alfalfa range was provided. Allowing birds free access to such range gave highest egg production and lowest mortality, but limiting access to the range to 2 hr. daily markedly improved the quality of the eggs. Neither the wheat and Sudan grass range nor the cut alfalfa were as efficient as the alfalfa range. The pen receiving cod-liver oil, dried buttermilk, and alfalfa leaf meal without succulent green feed produced practically as well and had only slightly higher mortality than those on alfalfa range, but feed costs were significantly higher.

Poultry litters, W. C. Thompson (*New Jersey Stas. Hints to Poultrymen, 25 (1938), No. 2, pp. 4, fig. 1*).—A 10-point test is described which may be applied to determine the desirability of various poultry litters.

Culling the flock for egg production, T. W. Noland (*Missouri Poultry Sta. Bul. 39 (1938), pp. 16, figs. 12*).—Methods for culling poultry by physical examination are fully described and illustrated.

A weekly standard for egg production, C. S. Platt (*New Jersey Stas. Hints to Poultrymen, 25 (1938), No. 3, pp. 4, figs. 2*).—A standard chart for the weekly egg production of pullet and hen flocks throughout the year, based on several years' records of the New Jersey egg-laying tests, is presented. By the use of simple calculations as described the production of a flock for any given week may readily be compared with the standard.

The effect of resecting a part of the uterus on the formation of the hen's egg, V. S. Asmundson and B. R. Burmester (*Poultry Sci., 17 (1938), No. 2, pp. 126–130*).—Continuing this investigation (E. S. R., 75, p. 824), the composition of eggs laid by normal hens was compared with that of eggs laid by the same hens after a section 4–16 cm^2 in area had been resected from the lateral or ventral wall of the uterus of each. After the operation the eggs laid were more variable in shape and the shells weighed about 29 percent less (shell protein declined only 9 percent), while the weight of other parts of the egg remained the same as before or increased. The percentage solids in the albumin decreased significantly, but the total amount of solids changed but little. The amount and percentage of ash increased significantly. Apparently as a result of resecting a part of the uterus slow shell formation or a longer latent period before shell secretion started permitted more water with its soluble salts to enter the egg through the shell membrane.

Liver lipids of the laying and non-laying bird, F. W. Lorenz, I. L. Chaikoff, and C. Entenman (*Jour. Biol. Chem., 123 (1938), No. 2, pp. 577–585*).—In a further study (E. S. R., 79, p. 236) the relation of diet, sex, and ovarian activity to the liver lipids of the White Leghorn fowl was determined. Males of all ages and immature females showed similar concentration of liver lipids, including free and esterified cholesterol, phospholipids, and neutral fat. The onset of maturity caused a pronounced increase in the neutral fat in the liver of females, but no change in the concentration of other lipid fractions. Increasing the fat content of the diet led to a decrease in the neutral fat content of the livers of actively laying birds. Neutral fat of the livers was more variable on a low-fat than on a high-fat diet. For birds on a high-fat diet a significant correlation coefficient was found between total fatty acids of the liver and the rate of egg production (corrected for pause periods) and the number of eggs laid during the last 7 days of the trial. Similar trends occurred on the low fat diet, although excessive variability masked the correlation.

Lipogenesis in the animal body, with special reference to the physiology of the goose, F. G. Benedict and R. C. Lee (*Carnegie Inst. Wash. Pub.*

489 (1937), *pp. IX+232, figs. 30*).—This monograph deals with the physiology of the goose under normal conditions and during periods of prolonged fasting and surfeit feeding. The technics employed in these studies are described in detail.

The calcium and phosphorus balance of laying hens, C. L. MORGAN and J. H. MITCHELL. (S. C. Expt. Sta.). (*Poultry Sci., 17* (*1938*), *No. 2, pp. 99–104*).—The calcium and phosphorus balance of three White Leghorn pullets was determined for 31 consecutive 15-day periods, starting just prior to the laying of the first egg. During the early egg laying period pullets were generally in negative calcium balance, but later they reached a positive balance without any change in the level of egg production. High egg production was not necessarily associated with negative calcium balance when a supply of this element was available in usable form. The ability of hens to utilize calcium appeared to be an individual characteristic, high-producing hens consuming and utilizing greater quantities of calcium than low-producing ones. The return to positive balance was accompanied by a reduction in the amount of eggshell, evidently due to the exhaustion of previously stored reserves of calcium and the need of the bird to maintain minimum amounts of this element in her system. Under the feeding regime followed, there was no lack of phosphorus for egg production. Egg production and molt showed greater relationship to maintenance of body weight than calcium balance, but continued inability to consume and utilize sufficient calcium to maintain positive balance resulted in cessation of laying.

The relationship between blood calcium and blood phosphorus and the effect of variations in the calcium content of the ration on ovulation and blood calcium changes in the laying pullet, H. J. DEOBALD, J. B. CHRISTIANSEN, E. B. HART, and J. G. HALPIN (*Poultry Sci., 17* (*1938*), *No. 2, pp. 114–119, figs. 4*).—Further studies on the calcium metabolism of laying pullets are reported (E. S. R., 75, p. 825). When Barred Rock pullets approaching laying age were fed at a constant level of 1 g of ground oystershell daily, they showed a rather constant and normal blood calcium level of from 7 to 9 mg per 100 g of whole blood during immaturity, followed by a marked rise from about 15 to 25 days before the first egg was laid and a subsequent fall at about the same rate. Egg production always began from 3 to 7 days after the peak in blood calcium was reached. However, at this low level of calcium intake egg production was almost completely inhibited, and egg eating was prevalent.

When these pullets were subsequently divided into three groups and supplied 0, 1 g daily, and ad libitum oystershell, respectively, egg production continued to be inhibited in the first two groups, and blood calcium continued to show a regular variation which was quite characteristic for each individual hen. The third group, after from 3 to 20 days at a very low blood calcium level, showed a rise and fall similar to pullets coming into lay, and egg production began 3 days or longer after the peak in blood calcium was reached. Apparently high blood calcium is not an indication of egg production, since eggs were usually laid during periods of low, constant, or descending blood calcium, and high production was correlated with periods of little or no variation. Total blood phosphorus was directly correlated with calcium content except during the initial rise in blood calcium just prior to first laying.

The seasonal variations in interior egg quality of new laid eggs, L. A. WILHELM and V. HEIMAN (*Washington Sta. Bul. 358* (*1938*), *pp. 20, figs. 9*).—Using the yolk color index (E. S. R., 75, p. 243) and the albumin index (E. S. R., 76, p. 234) as measures of egg quality, all eggs produced by the experimental pullets over 364 days were weighed and broken out for quality measurements. Hens were weighed weekly and observed as to any abnormalities in physical condition.

There was no evidence of seasonal change in the yolk color and no significant correlation between yolk color and total egg production. A downward trend in albumin quality was observed from October to July, after which the quality tended to improve. Albumin quality was not directly affected by the temperature in the pens, and no significant correlation was found between albumin index and total production, percentage production at 10, 20, or 40 weeks, or egg weight at 20 or 40 weeks. A rather extensive review of the literature on methods of determining egg quality and illustrations of the apparatus used in this study are presented.

Preserving egg quality on the farm, L. M. Black (*New Jersey Stas. Hints to Poultrymen, 25 (1938), No. 5, pp. 4*).—Common causes for deterioration in egg quality and methods for preserving quality are discussed.

DAIRY FARMING—DAIRYING

Dairy research: A report by the dairying and animal products committee on a review undertaken by them of dairy research in progress in Great Britain, including a review of the work of dairy bacteriologists in England and Wales, W. C. Dampier et al. (*[Gt. Brit.] Agr. Res. Council Rpt. Ser., 3 (1938), pp. [5]+101, pl. 1; also in [Gt. Brit.] Agr. Res. Council Rpt., 3 (1935–37), pp. 285–320*).—This report presents a brief description of the equipment and operation and a résumé of the research activities of the various dairy research agencies in Great Britain.

[Dairy investigations in Ohio] (*Ohio Sta. Bul. 592 (1938), pp. 77–82, 83–89, 90–92, figs. 4*).—Included are brief reports by C. F. Monroe, L. E. Thatcher, A. E. Perkins, C. C. Hayden, W. E. Krauss, R. G. Washburn, C. E. Knoop, B. H. Edgington, T. S. Sutton, and J. B. Brief on the relative palatability of the three common types of soybean oil meal for dairy cows, the value of mixtures of peas, flaxseed, and oats (grown together) for milking cows, the loss of juice and weight-volume relationship at different pressures of ensiled crops, corn-soybean silage v. alfalfa hay and corn silage in dairy rations, the loss of carotene in hay making, the pH of the contents of the bovine rumen, bone growth in dairy calves receiving whole milk fortified with magnesium carbonate, the nutritive value of pasteurized v. raw milk, and of pasture produced milk v. dry feed produced milk, factors affecting the vitamin C content of milk, the effect of vitamin A concentration in the ration on mineral assimilation, the effect of ultraviolet light on dairy calves and on the health of dairy cattle, and the effect of vitamin A deficiency on the structure of the gonads and the pituitary gland.

[Notes on dairying] (*Farm Res. [New York State Sta.], 4 (1938), No. 3, pp. 5, 11, figs. 2*).—Included are the following: Dairying in New Zealand Is Chief Source of National Income, by G. J. Hucker (p. 5), and Observations From the World's Dairy Congress, by A. C. Dahlberg (p. 11).

[Investigations with dairy cattle and dairy products in Indiana] (*Indiana Sta. Rpt. 1937, pp. 8, 9, 39–44, figs. 2*).—Included are brief reports of studies on the vitamin A requirements of dairy cows, the vitamin A suppressing factor in soybeans, and the effect of ground soybeans in the ration on the fat test of milk, by J. H. Hilton, J. W. Wilbur, W. F. Epple, and S. M. Hauge.

Studies with dairy products, by E. H. Parfitt, W. H. Brown, B. E. Horrall, and Epple include factors causing "cappy flavor" in milk, factors affecting the body, texture, and quality of ice cream, the character of Indiana butter from the standpoint of quality, the enzymes in sweet and sour cream as related to the keeping quality of butter, the effect of pH and season of the year upon the keeping quality of creamery butter, a comparison of methods for wash-

ing and sterilizing milking machines, and the lecithin content of milk and cheese products. Marketing studies by V. C. Manhart and K. C. Boxell relate to the producers' methods of disposing of milk and dairy products and the returns secured.

A comparative study of the value of alfalfa and a mixture of alfalfa and smooth brome grass as a pasture for dairy cattle, C. M. Harrison, K. T. Wright, and G. E. Taylor (*Michigan Sta. Quart. Bul., 20 (1938), No. 4, pp. 225–228*).—In two grazing trials with milking cows, grazing extended from May 27 to July 18 in 1936 (a very dry season), and from May 18 to August 31 in 1937 (a favorable season). The alfalfa and the alfalfa-bromegrass mixture each provided 99 pasture days per acre and yielded 1,022 and 1,144 lb. of total digestible nutrients per acre, respectively, in 1936. They furnished 168 and 175 days of grazing and yielded 1,865 and 2,008 lb. of total digestible nutrients per acre, respectively, in 1937. Results indicated that it was possible to get a profitable return per acre by grazing good cows on such pasture during the summer period when bluegrass pastures were of very limited value.

Action of molybdenum in nutrition of milking cattle, W. S. Ferguson, A. H. Lewis, and S. J. Watson (*Nature [London], 141 (1938), No. 3569, p. 553*).—This report from the Agricultural Research Station, Jealott's Hill, describes a rather large area under pasture which cannot be grazed with cows during the normal grazing season without rapid decreases in milk yield, marked loss of condition, and even death of the animals. Spectrographic examination of a few samples of herbage from this unhealthy area and from nearby healthy areas showed that the molybdenum content of the former was considerably higher than of the latter. Feeding small amounts of soluble molybdates to a number of dry cows on normal rations produced scouring and loss of condition similar to that occurring in cattle grazed on the affected area. While the toxicity of molybdenum was suggested by these findings, its exact mode of action was not determined.

Secretion of milk, D. L. Espe (*Ames, Iowa: Collegiate Press, 1938, pp. XIV+265, [pl. 1], figs. 49*).—This book deals with the various factors affecting the normal functioning of the mammary gland and is intended primarily as a text for college students. Successive chapters deal with phylogenetic development of the mammary gland, anatomy of the udder, theory of milk secretion, factors affecting the amount and composition of milk, nervous control, hormonal control, miscellaneous factors related to milk secretion, and the effect of feed on the amount and composition of milk. A bibliography containing 695 references to the literature is appended.

An experiment on the nutritive value of winter-produced "summer" milk, J. C. Drummond, E. Singer, S. J. Watson, W. S. Ferguson, and M. S. Bartlett (*Jour. Hyg. [London], 38 (1938), No. 1, pp. 25–39*).—Under the terms of this experiment, "winter" milk was produced by a group of cows receiving the usual ration of hay, roots, and concentrates, while "summer" milk was produced by cows fed on a similar ration in which a part of the hay and concentrates was replaced by artificially dried grass. Two similar groups of schoolboys ranging in age from 5 to 16 yr. were selected as experimental subjects. Both groups received ordinary herd milk from July through September, then from October until March one group received the winter milk and the other group the summer milk. During this experimental period the carotene content of winter milk steadily declined from 0.8 mg per 100 g of fat to about 0.2 mg, while that of summer milk did not fall below 0.5 mg at any time. Periodic records of height, weight, and chest measurements of the boys were obtained. A statistical examination of the data failed to show that the summer milk

exerted a beneficial influence detectable by the improvement in growth or general conditions of health.

Pea vine silage and quality milk, W. H. Peterson. (Univ. Wis.). (*Canning Trade, 60 (1938), No. 45, pp. 7, 8*).—Analyses are presented for seven lots of pea-vine silage, including five lots of stacked material and two lots made in silos, one with and one without mineral acid. Judged by the pH and ammonia content, most of the silages were well preserved. The carotene content was very low in four lots of the stacked silage but relatively high in one stack and in the lots in silos. Milk from Holstein herds fed good pea-vine silage averaged 8 μg of carotene and 10 μg of vitamin A per gram of butterfat, indicating that such silage is a good source of carotene in dairy rations.

Effect of oxygen, light, and lactoflavin on the oxidation of vitamin C in milk, D. B. Hand, E. S. Guthrie, and P. F. Sharp. (Cornell Univ.). (*Science, 87 (1938), No. 2263, pp. 439–441*).—The interrelationships of the oxygen and lactoflavine content of milk and exposure to light in causing the oxidation of vitamin C in milk are discussed. Experiments with pure compounds and artificial light showed that rapid oxidation of ascorbic acid occurred in the presence of air, light, and lactoflavine, while the removal of either light, oxygen, or lactoflavine largely prevented oxidation of this compound. Milk from which oxygen had been removed (method described) could be exposed to sunlight in clear glass bottles for a considerable period, stored in the dark for 1 week in the presence of dissolved copper, or heated for 3 hr. at 63° C. in the presence of copper without appreciable diminution of reduced ascorbic acid and without development of a true oxidized flavor. If, after a few days, oxygen-free milk was shaken with air, the oxidation of the reduced ascorbic acid proceeded at a rate normal for the sample before it had been freed from oxygen.

Do the facts justify homogenizing milk? J. C. Marquardt (*Farm Res. [New York State Sta.], 4 (1938), No. 3, pp. 1, 7, figs. 3*).—The viewpoints of the consumer, the medical profession, and the milk industry with regard to the homogenization of milk are briefly discussed, and the need for further research in this field is stressed.

Factors influencing the rate of fermentation of Streptococcus lactis, O. Rahn, C. P. Hegarty, and R. E. Deuel. (Cornell Univ.) (*Jour. Bact., 35 (1938), No. 5, pp. 547–558*).—Studies on the rate of lactic fermentation by two strains of *S. lactis* indicated that satisfactory measurements could be made simply by titration when the cells were obtained by centrifugation and suspended in buffered glucose solution at pH 7.0. Maximum fermentation occurred at pH 7.0, and retardation was less in alkaline medium than in acid medium. A buffer containing 4 percent phosphates supported most rapid fermentation, while largest amounts of final acidity were produced with 6 percent phosphates. Sugar concentration did not affect the rate so long as more than 0.2 percent of glucose was present. One percent of sodium lactate slightly retarded and 4 percent markedly retarded fermentation. Agitation by a current of air or oxygen also retarded, while the presence of nitrogen increased, the rate. The age of cells (2 hr. to 2 days) had little influence if cells were kept young by frequent transfers. When old cells were transferred to fresh medium, fermentation was doubled when cells came out of lag and decreased again after the cell number had doubled. Storing cells in phosphate buffer at 2° C. for 4 days did not decrease fermenting capacity or viability.

Studies of two substitutes for gelatin in ice cream, P. S. Lucas and I. A. Gould (*Michigan Sta. Quart. Bul., 20 (1938), No. 4, Sup., pp. 263–269*).—In the study reported, gelatin, a sodium alginate preparation (Dariloid), and a vegetable lecithin preparation (Aqualoid) were compared as stabilizers in ice cream.

All mixes were prepared, processed, and frozen in an identical manner. Unstabilized, 0.4 percent gelatin, 0.25 percent Dariloid, and 0.5 percent Aqueloid mixes all aged 24 hr. reached 100 percent overrun in 1 min. 44 sec., 2 min. 12 sec., 2 min. 12 sec., and 3 min. 30 sec., respectively. The pH and sediment tests were practically identical for all mixes. The Aqueloid ice creams were little better than unstabilized samples in body or resistance to melting and had a disagreeable flavor. The Dariloid ice creams were inferior to gelatin ice creams in body and texture and in resistance to melting. In a second series, comparing 0.3 and 0.35 percent Dariloid with 0.4 percent gelatin, mixes were frozen immediately after processing and after 24 hours' aging. The two products gave similar results in maximum overrun and in time required for securing overrun. Dariloid at 0.3 percent and the gelatin were apparently equally effective, giving ice creams of very similar body and texture score and similar melting qualities except that the gelatin samples were more resistant during the first hour of exposure. Mixes containing 0.35 percent Dariloid were overstabilized and those containing 0.25 percent were understabilized.

Sodium alginate—a stabilizer, V. C. Stebnitz and H. H. Sommer (Univ. Wis.). (*Ice Cream Field, 32 (1938), Nos. 3, pp. 48, 49, 55; 4, pp. 52, 53*).—A more detailed report of research previously noted (E. S. R., 77, p. 537).

VETERINARY MEDICINE

[Work in animal pathology by the Indiana Station], L. P. Doyle, A. L. Delez, R. A. Craig, and C. E. Newton (*Indiana Sta. Rpt. 1937, pp. 75–77*).—Reference is made (E. S. R., 77, p. 390) to a study of the death loss in newborn pigs and of fowl paralysis, leucosis, and neoplastic conditions, a comparison of the whole blood and the tube test for pullorum disease, immunization studies of Bang's disease, hog cholera studies, investigation of outbreaks of animal diseases, and a potency test of hog cholera serum.

[Report of animal disease investigations by the Ohio Station] (*Ohio Sta. Bul. 592 (1938), pp. 102, 103, 105–107*).—A report is made of the work of the year (E. S. R., 77, p. 695) with crystal violet vaccine for the prevention of hog cholera, by R. H. Edgington; losses in feeder lambs, by Edgington and D. S. Bell; pseudorabies transmission, by Edgington and N. A. Frank; mastitis in cattle, by A. J. Schalk, Edgington, and T. S. Sutton; a survey of sheep parasites for Ohio, by [C. A.] Woodhouse, Bear, and R. E. Rebrassier; and sheep parasite experiments, by Bell, Rebrassier, and Woodhouse.

The anatomy of the domestic animals, S. Sisson, rev. by J. D. Grossman (*Philadelphia and London: W. B. Saunders Co., 1938, 3. ed., rev., pp. 972, figs. 770*).—In this revision (E. S. R., 32, p. 78) the general plan and scope of the work remains unchanged except for the addition of a chapter on the anatomy of the chicken (pp. 929–948). The number of illustrations has been materially increased, and numerous old figures have been replaced by new ones.

Clinical allergy, A. H. Rowe (*Philadelphia: Lea & Febiger, 1937, pp. 812, [fig. 1]*).—This work on clinical allergy due to foods, inhalants, contactants, fungi, bacteria, and other causes, which deals with the manifestations, diagnosis, and treatment, is presented in 16 chapters and an appendix. A bibliography of 80 pages, an index of allergens and excitants, an author index, and a general index are included.

Parasitology, with special reference to man and domesticated animals, R. Hegner, F. M. Root, D. L. Augustine, and C. G. Huff (*New York and London: D. Appleton-Century Co., [1938, rev.], pp. 812, figs. 308*).—Following an introduction by R. Hegner (pp. 1–23), section 1 on protozoology is also by R. Hegner

(pp. 25–207), section 2 on helminthology by D. L. Augustine (pp. 209–489), and section 3 on arthropods of parasitological importance, by F. M. Root, revised by C. G. Huff (pp. 491–699). Included are a chapter devoted to notes on collecting, preserving, and rearing arthropods of parasitological importance (pp. 696–699), a bibliography (pp. 701–779), and author and subject indexes. The book is a general revision (E. S. R., 62, p. 167).

Selenium problems in South Dakota (*Brookings: S. Dak. State Planning Bd., 1937, pp. [3]+111+30, figs. 6*).—This report describes briefly the discovery of selenium poisoning by pasture plants in South Dakota, the relation of the occurrence of the element to geological formations (it has been found only where soils of Cretaceous age are exposed), the absorption of selenium by specially adapted plants and the conversion to an available state of a part of the soil selenium content by "converter plants," the poisoning of livestock by seleniferous vegetation, and "the selenium problem in relation to public health."

The detection of antigenic variants of Brucella by means of an opsonocytophagic test, M. Munger and I. F. Huddleson (*Jour. Bact., 35 (1938), No. 3, pp. 255–260*).—Contributing from the Michigan Experiment Station, the authors report having found an opsonocytophagic test conducted with citrated normal whole blood from humans or guinea pigs to be the most satisfactory method for detecting an antigenic variant culture of *Brucella*. "The bacterial cells of an antigenic variant culture are phagocytized in large numbers by the polymorphonuclear cells in citrated normal whole blood from humans and guinea pigs. Bacterial cells of a normal culture are phagocytized slightly if at all by leucocytes in citrated normal blood of the same species. Antigenic variants of *Brucella* are unsuitable for use in the opsonocytophagic test for detecting specific *Brucella* opsonins in blood of human beings or animals."

Wheat germ oil in Brucella infection in cattle and guinea pigs, R. Gwatkin and A. H. MacLeod (*Canad. Jour. Compar. Med., 2 (1938), No. 5, pp. 133–136*).—In the experiments reported subcutaneous injections of wheat-germ oil did not modify the course of infection of *B. abortus* in treated cattle nor prevent or modify the course of the disease in guinea pigs.

Sulphanilamide in Br. abortus infection in animals, R. F. Montgomerie (*Vet. Rec., 50 (1938), No. 13, pp. 380–382*).—The results of preliminary experiments aimed at determination of the action of sulfanilamide on *Brucella abortus* infection in animals are reported. Four guinea pigs that had been injected subcutaneously with *B. abortus* suspensions were each given a total of 1,800 mg of sulfanilamide, the administration extending over a period of 12 days. *B. abortus* infection appeared to have been eliminated from three and materially reduced in the fourth. Experiments with a goat indicated that treatment with sulfanilamide cleared the udder of *B. abortus* infection, it apparently being resistant thereafter to attempted reinfection by udder injection.

The treatment of "snifflles" in the rat with sulfanilamide, N. R. F. Maier (*Science, 87 (1938), No. 2263, p. 439*).—In the treatment of 14 rats suffering from sniffles, a form of pneumonia responsible for a high mortality in all laboratory rat colonies and from which recovery is rare, 12 that had been administered 50 mg of food daily permanently recovered. All 7 animals in the control group died after varying lengths of time.

The mode of action of sulfanilamide and Prontosil, R. Finkelstein and J. M. Birkeland. (Ohio State Univ.). (*Science, 87 (1938), No. 2263, pp. 441, 442*).—In an attempt to analyze the significance of the various factors which might play a part in the chemotherapeutic activity of sulfanilamide and Prontosil the leucocytes and the streptococci were treated in various ways before setting up the tests for phagocytosis. It was found that (1) when leucocytes

were well washed of plasma, (2) when the leucocytes were treated with varying dilutions of the drug and then well washed, or (3) when the streptococci were treated with varying concentrations of the drug and then washed, no more phagocytosis occurred than in controls. It appears that serum or a factor in it is necessary to obtain the effect of the drug.

Just how sulfanilamide enhances phagocytosis is not clear, but the results briefly reported here suggest that sulfanilamide or a serum-sulfanilamide complex acts as an opsonin.

Experiments with sodium sulfanilyl sulfanilate, P. J. G. Plummer, C. A. Mitchell, and R. V. L. Walker (*Canad. Jour. Compar. Med., 2 (1938), No. 5, pp. 139–141, fig. 1*).—In tests conducted with ferrets infected with distemper virus and with guinea pigs infected with equine encephalomyelitis virus sodium sulfanilyl sulfanilate did not appear to have any influence on the affections. The authors find no reason for the difference in these results and those reported by Dochez and Slanetz (E. S. R., 78, p. 854).

Failure of alfalfa to prevent the hemorrhagic sweetclover disease, W. K. Smith (*Science, 87 (1938), No. 2262, p. 419*).—The author found no indication that alfalfa exerts a protective action against the sweetclover disease. Symptoms of the disease appeared in rabbits that had been fed alfalfa to the amount of 50 percent of the diet along with toxic hay and toxic extracts.

The differentiation of pathogenic staphylococci from non-pathogenic types, G. H. Chapman, C. Berens, E. L. Nilson, and L. G. Curcio (*Jour. Bact., 35 (1938), No. 3, pp. 311–334, figs. 2*).—Studies reported, the details of which are presented in tables, show that "the coagulase test is the most reliable single test for the differentiation of pathogenic from nonpathogenic staphylococci. When used in conjunction with pigment and coagulase tests, hemolysis of rabbit blood agar permits simple estimation of the degree of pathogenicity of a strain or variant. Tests for crystal violet agar, bromothymol blue agar, and mannitol fermentation properties are useful as supplementary tests. The two latter are more useful for isolation than for differentiation."

A list is given of 21 references to the literature.

Streptococcus salivarius, Streptococcus bovis, and the "Bargen streptococcus," J. M. Sherman, P. Stark, and C. E. Safford. (Cornell Univ.). (*Jour. Bact., 35 (1938), No. 1, pp. 64, 65*).—The authors have obtained additional information which adds weight to the differentiation of *S. salivarius*, the most common streptococcus in the normal human throat, and *S. bovis*, the predominating type in the throat and intestines of bovines, the validity of which latter as an independent species has been questioned. Two 100 percent differential tests appear to exist in the greater thermal resistance and the greater bile tolerance of *S. bovis*. Also there are three strong majority differential tests based upon the higher maximum temperature of growth of *S. bovis* and its usual ability to hydrolyze starch and ferment arabinose, substances which appear never to be attacked by *S. salivarius*. These tests are supported by several other slight differences.

The authors' study of a number of strains of the Bargen streptococcus, believed by some to have a causative role in ulcerative colitis, indicates that it is not closely related to the enterococci but belongs to the *S. bovis* group. Some strains of the Bargen streptococcus are identical with typical cultures of *S. bovis* so far as studied; other strains agree with the non-starch-hydrolyzing variety of *S. bovis*. What appears to be the Bargen streptococcus has been isolated from the feces of normal individuals.

Experiments on the nutrition of streptococci, S. H. Hunter (*Jour. Bact., 35 (1938), No. 4, pp. 429–440*).—It has been found that by the use of deproteinized skim milk and a casein hydrolysate amino acid requirements for several species

of streptococci may be demonstrated. "Strains of *Streptococcus asalignus*, *S. bovis*, and *S. mastitidis* were found that required cystine (or cysteine) in addition to at least one more amino acid present in acid hydrolyzed casein. Treatment of deproteinized milk with fuller's earth inactivated it for the above streptococci as well as for *S. liquefaciens*. *S. bovis* requires at least two nonamino-acid factors: One precipitated by mercuric sulfate, the other not. A great deal of variability in growth requirements was found within the species *S. bovis* and *S. salivarius*."

Studies in streptococcic mastitis: Comparison of several diagnostic and test methods, C. A. Mitchell, R. V. L. Walker, and F. A. Humphreys (*Canad. Jour. Compar. Med., 1 (1937), No. 2, pp. 15–25*).—Details of comparisons of diagnostic and test methods for streptococcic mastitis are given in tables. Of 91 infected animals tested the chloride method gave 81.32 percent positive; catalase 62.64; bromothymol blue 61.54; string cup 27.47; the combined bromothymol blue, catalase, and chloride tests and taking a positive in any one test as being diagnostic of infection 83.51; physical examination combined with the bromothymol blue, catalase, and chloride tests and taking a positive finding in any one test as being diagnostic of infection 92.3; combined bromothymol blue, catalase, and chloride tests but requiring positive reactions in all as being diagnostic of infection 54.94; physical examination alone 67.03; and bacteriological examination alone 92.3 percent.

Bovine contagious abortion, I, II (*Vet. Rec., 50 (1938), No. 24, pp. 717–726, figs. 23; pp. 727–729, 730*).—This is presented in two parts.

I. *Experiments with a new type of dead vaccine*, W. R. Kerr.—A report is made of experiments which were directed toward the induction of resistance to infection with *Brucella abortus* by means of a new type of dead vaccine. "In three of the experiments the experimental animals were guinea pigs, and the results strongly suggest that the new type of dead vaccine had induced a partial immunity to infection with *B. abortus*. In a fourth experiment the resistance of vaccinated heifers to an intense natural infection was compared with that of unvaccinated control heifers. All of the 10 pregnant animals in the control group aborted, and only 3 of the aborted calves survived. Nine out of the 11 pregnant heifers in the vaccinated group aborted, and 5 of the calves lived and were reared; the remaining 2 animals carried their calves to full term and produced healthy offspring. While it cannot be said that these results are of immediate practical economic value, it is suggested that the vaccinated group had acquired a certain degree of partial immunity as compared with the control group. It is possible that this partial immunity was masked to some extent by the intensity of the infection.

"The results of the bovine experiment were comparable with those obtained in experiments with guinea pigs. Ninety percent of the milk samples obtained from the 21 lactating heifers were positive to tests for *B. abortus*. Eight of the 9 living calves displayed passive agglutinin response to tests for *B. abortus*, reverting to a negative agglutinin response at about 6 weeks after birth. The ninth calf displayed an active agglutinin response.

"The results of the agglutination tests on the control group were characterized by a low and delayed agglutination test. These observations suggest that agglutination standards as applied in segregation control of contagious abortion may need serious reconsideration."

II. *The relationship between plasma proteins and agglutination titre*, R. H. Common and W. R. Kerr.—"In heifers vaccinated with a dead vaccine against *B. abortus* the plasma globulin tended to rise in association with the agglutination titer. Vaccinated heifers and unvaccinated control heifers which had ac-

quired a heavy infection with *B. abortus* displayed a sharp increase of plasma globulin in association with abortion as well as a sharp rise in agglutination titer."

A study of experimental streptococcic mastitis in dairy cattle, C. S. BRYAN (*Michigan Sta. Quart. Bul., 20 (1938), No. 4, Sup., pp. 270–283*).—An extended account of the work noted from another source (E. S. R., 79, p. 107), the details appearing in five tables.

Entozon and acriflavine for the treatment of chronic contagious bovine mastitis, A. W. STABLEFORTH and N. J. SCORGIE (*Vet. Rec., 50 (1938), No. 23, pp. 663–676, fig. 1*).—Experiments conducted, the details of which are presented in 11 tables, led to the conclusion that "chemotherapeutic treatment of early cases of *Str[eptococcus] agalactiae* mastitis (the common chronic contagious mastitis) by injection via the teat canal may be recommended, particularly as an adjunct to control by segregation of infected cows on the basis of cultural examinations of milk samples. Acriflavine 1:10,000 is to be preferred. Milking cows should be given two 5-min. treatments, dry cows two of 24 hr. each. The results of treatment should be assessed by a cultural examination 7 to 14 days after treatment, or after subsequent calving in the case of cows treated while dry. In either case a confirmatory examination should be made 1 mo. later, or at the next herd test."

Observations on bovine venereal trichomoniasis, C. W. REES. (U. S. D. A.). (*Vet. Med., 33 (1938), No. 7, pp. 321–334, figs. 2*).—The author finds that bovine venereal trichomoniasis is caused by a flagellated protozoan, *Trichomonas foetus*, and that the genital tract of both males and females may be infected, the disease being ordinarily transmitted during coitus. "In the cow the parasite induces a secretion of mucus and accumulation of pus in the vagina, frequently followed by an uterine catarrh that may lead to sterility or, in the event of conception, may lead to pyometra or abortion. In the bull the parasite may produce temporary inflammation of the penis, but no injury to the spermatozoa. Recovery of the cow appears to lead to immunity. It is not known whether the bull throws off the infection. An average of 125 females of breeding age in a dairy herd under observation were examined 7 times; 10 of these (8 percent) were found positive for trichomonads. From the infected heifers and cows the average annual calf crop was 0.1 calf per cow; from the noninfected ones the average was 0.7 calf per cow. Nine females were slaughtered; all had been infected with *T. foetus*. Five of the cows had been pregnant and had reached full term without calving; 4 appeared to be sterile. At necropsy the uterus contained *T. foetus* in 6 cases and was negative in 3 cases. *T. foetus* was not found in sections of the uterus. Six of 20 bulls, or 30 percent, were positive for *T. foetus*. Each infected bull sired some living calves. In a slaughtered bull that had harbored *T. foetus* for several years the parasite was found on the penis. All other parts of the genital tract were negative."

A list is given of 43 references to the literature cited.

Differentiation by tuberculin testing of infection in cattle due to the human, bovine, and avian types of tubercle bacilli, R. STENIUS, trans. by J. EDWARDS (*Vet. Rec., 50 (1938), No. 22, pp. 633–637*).—A report of tests conducted at the State Veterinary Laboratory, Ministry of Agriculture, Finland.

Notes on some species of the nematode genus Cooperia from cattle and sheep, H. A. BAYLIS (*Vet. Rec., 50 (1938), No. 10, pp. 283, 284, figs. 3*).—These notes relate to the specific characters of *C. mcmasteri* Gordon 1932 and the status of *C. nicolli* and *C. fieldingi* Baylis 1929.

Observations on the bacterial flora of the intestine of normal sheep, P. S. WATTS (*Vet. Jour., 94 (1938), Nos. 2, pp. 60–74; 3, pp. 112–127*).—In

a study made of the bacterial flora of the intestine of normal sheep from Cambridgeshire and Leicestershire, *Bacterium coli* was the predominant aerobe in the small intestine. *Clostridium welchii* was the predominant anaerobe, with certain others present in small numbers in some of the cases. In the large intestine *C. welchii* (type A) was found in much greater numbers than any other anaerobe. *C. tetani* and *C. septique* were found to occur, the former being recovered from 15 percent and the latter from 19 percent of the large intestines of animals which were specially examined for their presence. *C. oedematiens* and *C. histolyticum* proved to be very rare.

A list of 68 references to the literature and a bibliography of 49 titles are included.

Braxy-like diseases of sheep.—I, The mechanism of entero-toxaemia, with particular reference to Cl. welchii type D, R. S. Roberts (*Vet. Rec., 50 (1938), No. 21, pp. 591–604, pls. 2, figs. 4*).—A report on enterotoxemia, the term employed to denote toxemia due to absorption from the alimentary tract of the toxin of an organism of the *Clostridium welchii* group.

Foot-rot in sheep: A preliminary note on the probable causal agent, W. I. B. Beveridge (*Jour. Council Sci. and Indus. Res.* [*Austral.*], *11 (1938), No. 1, pp. 1–3*).—This contribution summarizes the progress of work carried on in continuation of that reported in 1935 (E. S. R., 74, p. 855). Cultures of the spirochete *Spirochaeta penortha*, ever present in lesions of foot rot and suggested in 1935 as the causal agent, failed to produce the disease. No evidence was obtained that a filtrable virus is the causal agent. Examination of smears carefully prepared from the junction of the healthy and diseased tissue in foot rot cases revealed, in the majority of instances, a preponderance of two organisms—(1) *S. penortha* and (2) a Gram-negative bacillus closely resembling *Fusiformis necrophorus* but differing from it in being motile, referred to as the "fusiform" of foot rot. Cultures of this fusiform organism failed to produce foot rot in 37 feet to which it was applied, sometimes together with *S. penortha* and sometimes passaged a number of times through the feet of sheep. Cultures of other organisms, both anaerobes and aerobes, isolated from the lesions did not produce it.

It was apparent that foot rot, which behaves as a typical, specific, infectious disease and can be readily produced with material from lesions, is caused by an organism large enough to be deposited by ordinary centrifuging (5,000 r. p. m.) but which either is not readily cultivable on ordinary media or loses virulence in a few days under the conditions of artificial cultivation that were employed. This led to the testing after 5 days' incubation of whole mixed plate cultures of foot rot material grown on V. F.-blood-agar in an anaerobic atmosphere with various percentages of CO_2 added. Five such cultures having proved noninfective, a special medium that, among other constituents, contained 25 percent serum, was prepared. Two out of nine cultures on this medium proved infective. In smears from lesions an organism that had not been cultivated and to which little attention had been given due to its usually being present in comparatively small numbers was found to grow in some cultures on the special serum-enriched medium but not on V. F.-blood-agar. When isolated and applied to scarified sheep's feet, together with the spirochete and the fusiform organism, typical foot rot was set up. This organism, thought to belong to the genus *Bacteroides*, is referred to as "organism K." It is a "Gram-negative, nonsporing anaerobe which grows on V. F. media to which 25 percent serum has been added, but only very poorly on 5 percent blood-V. F.-agar. . . . It takes the form of rods, from 3μ to 10μ long and from 0.8μ to 1.2μ wide, having enlarged, knoblike ends. In cultures it is somewhat

smaller and the knobs are less pronounced or absent. It grows, though not vigorously, in V. F.-cooked heart medium, in which it produces blackening and later partial digestion of the meat particles. On 25 percent serum-V. F.-agar, incubated in an anaerobic atmosphere with 5 percent or more of CO_2, it forms colonies which are etched into the surface of the medium, giving them a very characteristic sunken appearance."

It is concluded that organism K is the primary causal agent of foot rot, and that *S. penortha* may also be necessary for the development of the typical disease. While the fusiform organism may also play a part, it is perhaps a secondary invader that is commonly present.

Investigations on the viability of the contagium of foot-rot in sheep, W. I. B. Beveridge (*Jour. Council Sci. and Indus. Res.* [*Austral.*], *11* (*1938*), *No. 1, pp. 4–13*).—In a tenacity study of the causative agent of foot rot of sheep it was found that in material from lesions, kept moist or air-dried, the infective agent survived 24 hr. but not 4 to 8 days. "When material from lesions was mixed with mud the infective agent usually survived 3 days, rarely 1 week, and never 3 weeks. In sheep feces it survived 1 week on one of two tests, but not 2 weeks. In a muddy yard infected by placing infected sheep in it the infective agent was demonstrated to have survived 24 hr. in one out of three experiments. In six experiments the infection could not be demonstrated in damp pasture from which infected sheep had been removed from 9 hr. to 2 weeks previously. The infective agent can survive at least 3.5 yr. in lesions on chronically infected sheep. Apparently-recovered sheep may occasionally harbor the infection for 7 mo. in superficial skin lesions between the digits, for at least a week in hidden foci of infection under the horn, and for 1 week without showing any lesions. On the other hand, sheep recovered for a month or more and showing no lesions are apparently free of the infection. The infection probably cannot survive in skin lesions on sheep elsewhere than on the feet."

The control of foot-rot in sheep, W. I. B. Beveridge (*Jour. Council Sci. and Indus. Res.* [*Austral.*], *11* (*1938*), *No. 1, pp. 14–20*).—It is pointed out that since the causal agent of foot rot cannot survive longer than a few weeks at most apart from the sheep, the removal during the summer of all sheep carrying the infection should entirely free the flock and property of infection. When thus eliminated the disease would not recur unless introduced from outside.

Development under sterile conditions of the sheep stomach worm Haemonchus contortus (Nematoda), R. W. Glaser and N. R. Stoll (*Science*, *87* (*1938*), *No. 2255, pp. 259, 260*).—A preliminary report of progress in the cultivation of parasitic stages of the sheep stomach worm, with a description of in vitro culture work.

Observations on the cellular elements and hemoglobin in the blood of sheep infected with the nematode Cooperia curticei, J. S. Andrews. (U. S. D. A.). (*North Amer. Vet.*, *19* (*1938*), *No. 2, pp. 40–44*).—In the studies reported, the results of which are presented in four tables, observations of the blood of lambs experimentally infested with *C. curticei* to the extent of from 458 to 25,033 worms per host animal showed a slight leucocytosis but no other significant changes.

The hydrogen-ion concentration of myiotic wounds in sheep and goats, E. W. Laake and C. L. Smith. (U. S. D. A.). (*Jour. Econ. Ent.*, *31* (*1938*), *No. 3, pp. 441–443, fig. 1*).—This contribution presents the experimental procedure and results of tests made in the determination of the H-ion concentration of exudates of 32 wounds in goats and of 20 wounds in sheep infested with the larvae of the screwworm.

An examination of pig sera for neutralising antibodies against the virus of Aujeszky's disease ("mad itch," "pseudo-rabies"), R. E. GLOVER (*Vet. Rec., 50 (1938), No. 13, pp. 377–380*).—In tests made of 50 samples of serums, representing 250 pigs and collected from various parts of England, against the virus of Aujeszky's disease, no evidence of the presence of neutralizing antibodies was obtained.

Equine degenerative arthritis, R. A. KELSER and G. R. CALLENDER (*Vet. Med., 33 (1938), No. 7, pp. 307–320, figs. 23*).—The authors found a large percentage of Army horses and mules in Panama affected with degenerative arthritis, involving principally the leg joints and causing varying degrees of lameness. The condition is not a phase of, nor associated with, osteomalacia. The primary cause is apparently not of bacterial origin nor is it inflammatory in character. The pathological changes suggest that the condition is a deficiency disease in which a disturbance occurs in the nutrition of the articular cartilages, without necessarily involving other tissues. A marked similarity exists between it and human degenerative arthritis. A list of 18 references to the literature is included.

Diseases and surgery of the dog, R. J. GARBUTT (*New York: Orange Judd Pub. Co., 1938, pp. 332, figs. 87*).—This work is arranged in alphabetical order.

Notes on the use of Prontosil in veterinary practice, C. S. HASELDEN (*Vet. Rec., 50 (1938), No. 15, pp. 439–441, fig. 1*).—Brief reports are made of five cases of a streptococcic disease of dogs treated by the administration of Prontosil. The author is led to conclude that Prontosil is indicated only in cases of generalized septicemia with a consequent rise in temperature, and that it is not of value in the eradication of localized purulent conditions. If used appropriately Prontosil gives most spectacular results, and in none of the five cases reported were any signs of toxicity observed.

A growing yeast medium for the cultivation of hemophilic bacilli and of an organism causing a bronchitis in chickens, J. P. DELAPLANE and H. O. STUART. (R. I. Expt. Sta.). (*Science, 87 (1938), No. 2269, pp. 585, 586*).—The authors have obtained much better growth of *Hemophilus gallinarum* and *H. influenzae* when cultivated with growing yeast than could be obtained from the use of a chicken blood medium. It is pointed out that the growing yeast supplies all the growth requirements for both organisms and that they have been successfully cultivated for several months in such a blood-free medium through weekly transfers.

A study was made of the value of this yeast in the cultivation of the filtrable virus of infectious bronchitis of chickens of a type clinically similar to that which studies had indicated was of a filtrable virus nature (E. S. R., 75, p. 547). Growth other than yeast was obtained from one chicken out of five in which cultures were obtained from the edematous fluids of the lungs of infected birds and used along with pure cultures of yeast to inoculate the medium. Stained preparations revealed two different types of organisms in addition to the yeast. The first seven transfers of this culture induced symptoms of bronchitis in chickens when inoculated intratracheally.

The organisms in question are comparatively large, very irregular in shape, appear singly, doubly, or in clumps, and are decolonized with Gram's stain after 24 hours' incubation. The shape may vary from irregular circular to pear or rod. The organisms have repeatedly failed to grow in or on chicken blood and other types of media, so that further studies will be required before any identification is possible. The use of such a medium has resulted in the isolation of an organism which may have otherwise escaped detection.

The effect of the X factor, of sodium chloride, and of the composition of the nutrient media upon the growth of the fowl coryza bacillus,

Hemophilus gallinarum, J. P. DELAPLANE, L. E. ERWIN, and H. O. STUART. (R. I. Expt. Sta.). (*Jour. Agr. Res.* [*U. S.*], *56* (*1938*), *No. 12*, *pp. 919–926*).—In growth studies of the fowl coryza bacillus the need of the X factor for the growth of the Rhode Island strains was revealed through the failure of the organism to grow in yeast extract or yeast suspensions at the base of nutrient agar slants. This factor may be supplied, as by the addition of autoclaved blood extract, or when the medium used to inoculate the yeast extract is of blood and sufficient of the X factor is carried over in the inoculum. Growth on yeast extract prepared by boiling was poorer than that on yeast extract prepared without heat. Yeast-cell suspensions plus autoclaved blood extract supported growth, but yeast-cell suspensions alone did not. The clotted blood serum of the horse, cow, sheep, goat, pig, and rabbit failed to support growth when employed in dilutions of 1 to 20 in broth, but the same serum broth supported growth when used at the base of nutrient agar slants. The study of the role of agar indicated that sodium chloride could partially but not completely replace the agar in furnishing these requirements for growth. The optimum salt concentration ranged between 1.5 and 2 percent. Chicken serum and yeast extracts which had been boiled failed to support growth except when used at the base of nutrient agar slants.

The relation of helminthiasis to leukaemia in domestic fowls, P. A. CLAPHAM (*Jour. Helminthol.*, *16* (*1938*), *No. 1*, *pp. 53–56*).—While the theory that leukemia and paralysis are caused by helminths is not now generally accepted, the author is led to suggest that there is considerable circumstantial evidence that the presence of the leukemia virus may predispose the host to helminthic infestation.

De-worming not beneficial to lightly infected pullets (*Wisconsin Sta. Bul. 440* (*1938*), *pp. 10, 11*).—Work by C. A. Herrick, J. G. Halpin, and C. E. Holmes is briefly noted.

A progress report of investigations in a blood protozoan disease of turkeys, E. P. JOHNSON, G. W. UNDERHILL, J. A. COX, and W. L. THRELKELD. (Va. Expt. Sta.). (*Va. Acad. Sci. Proc.*, *1937*, *p. 86*).—This is a progress report of work with a leucocytozoon disease, earlier accounts of which have been noted (E. S. R., 78, p. 402). Asexual stages of the protozoan are said to have been induced in the tissues of turkeys which had been inoculated with simuliids or blackflies that had engorged themselves several hours previously on blood from infected turkeys. "The gametocyte stage of the protozoan continues as a parasite of certain blood cells of the turkey for several months after infection if the bird survives. The asexual cycle of the protozoan in the turkey has been found to require from 9 to 13 days. Only young and mature gametocytes have been found in the turkey. Macrogametes, zygotes, ookinetes, and sporozoites have been found in the tissues of the fly. Infection in the turkeys has been entirely prevented by keeping the birds screened away from these flies during the months when the flies are active."

A blood protozoon of turkeys transmitted by Simulium nigroparvum (Twinn), E. P. JOHNSON, G. W. UNDERHILL, J. A. COX, and W. L. THRELKELD. (Va. Expt. Sta.). (*Amer. Jour. Hyg.*, *27* (*1938*), *No. 3*, *pp. 649–665*, *pls. 3*).—Report is made of studies of the etiology of the disease of turkeys noted above, which has caused considerable loss to growers in the southwestern part of Virginia. Following a review of the literature, presented with a list of 13 references, the materials and methods employed, including attempts at direct transmission from sick to well birds, the experimental transmission by flies, life history of the parasite, and the distribution of *S. nigroparvum* in Virginia, are considered. A brief discussion of control measures follows. Although found to resemble closely the white blood simuliid-transmitted parasite *Leucocytozoon*

smithi, the causative parasite may prove to be a new form. Weekly examinations of blood from turkeys infected in July have revealed that many gametocytes may remain in the blood of the turkey for as long as 6 mo., and that no appreciable morphologic change takes place in the organism until it is removed from the turkey and when taken into the body of the blackfly *S. nigroparvum*. From the evidence at hand the authors conclude that the sporozoite enters the blood of the turkey during the bite of infected simuliids and, in the blood plasma, first changes to an immature gametocyte and gradually grows to maturity, and in this stage may remain for several months. When taken into the stomach of the fly gametes are formed; macrogametes may be clearly observed. Microgametes have not been noted with certainty, however. The zygote stage seems clear, as does also the gradual uncoiling to become a motile ookinete. Oocysts have not been observed in the material studied; therefore, there is a gap from ookinete to sporozoite that is not made clear by the study.

Attempts to transmit the disease from sick and from carrier birds to uninfected birds by direct contact failed. Disease-free birds kept in 2 unscreened range shelters near a blackfly-inhabited stream and about 10 ft. from carrier birds became infected, although normal birds kept in a nearby house flyproofed by use of cheesecloth remained free from infection. In a further experiment in which 1 of the 2 houses was enclosed with ordinary window-screen wire, 16 mesh to the inch, 8 birds therein became infected during the summer, while all birds in the cheesecloth house remained uninfected. "Moreover, 200 turkeys kept in houses protected with cheesecloth in a section where the disease had occurred the previous year have also remained free throughout the season. That flies were present on this farm this year was evidenced by the fact that several turkeys kept in a nearby yard were found to have the protozoa in their blood later in the growing season, or about the middle of August."

Are there host strains within the species of Syngamus trachea? P. A. Clapham (*Jour. Helminthol., 16 (1938), No. 1, pp. 49–52*).—It is pointed out that there is experimental evidence that the rook, crow, jackdaw, magpie, jay, starling, turkey, pheasant, and partridge strains of the gapeworm *S. trachea* are transmissible to other birds and are liable to set up disease therein when the indirect life cycle, using an intermediate host, is adopted. This is thought to be the normal method of transmission under natural conditions, since it has been shown by Taylor (E. S. R., 73, p. 692) that the larvae can remain infective in the earthworm up to a period of 3.5 yr. and that the earthworms are important storage agents of the larvae. Since certain of these birds, notably the rook, crow, and starling, are extraordinarily abundant in England and often frequent feeding grounds in vast numbers, it is considered quite possible that they are the causes of some of the unexplained outbreaks among chicks of domestic and game birds that are reported from time to time.

AGRICULTURAL ENGINEERING

[Agricultural engineering investigations by the Indiana Station] (*Indiana Sta. Rpt. 1937, pp. 12–15, 16–20, figs. 3*).—The progress results are briefly noted of a survey of electric fencing units, by T. E. Hienton and J. M. Fore; studies of electric heaters for fruit washers, use of electric energy for brooding chicks, electric dairy water heaters, storage losses with sweetpotatoes, precooling fresh fruits in refrigerator cars, electric soil sterilization, and use of electric heat in automatic water fountains in experimental hog lots, all by Hienton; supplementary irrigation of inbred lines of corn, by Hienton and Fore; the combined harvester-thresher, the adaptability of certain varieties of oats to harvesting

with the combine, atmospheric corrosion of wire and wire products, and field silage harvester, all by I. D. Mayer; the use of low-pressure pneumatic tires on a power-driven manure spreader, by R. H. Wileman; temperature and humidity conditions in poultry houses on the station farm, by Mayer and C. W. Carrick; and cornstalk coverage, rubber tires v. steel wheels for tractors, and seed corn drying tests, all by Wileman.

[Agricultural engineering studies of the Ohio Station] (*Ohio Sta. Bul. 592 (1938), pp. 118–122, figs. 3*).—Data are briefly noted on the efficiency of combine harvesters under Ohio conditions, by G. W. McCuen and E. A. Silver; hybrid corn and corn planter seed plate relationships, by C. O. Reed and G. H. Stringfield; ear corn pressure on crib walls and floors and wheat storage studies, both by R. C. Miller and [G. R.] Shier (coop. U. S. D. A.); and the use of electricity in soil sterilization and the heating of plant beds in tomato production, by I. P. Blauser.

Surface water supply of the United States, 1936.—Part 10, The Great Basin (*U. S. Geol. Survey, Water-Supply Paper 810 (1938), pp. IV+90, pl. 1*).—This paper presents the results of measurements of flow made on streams in this basin during the year ended September 30, 1936.

Erosion and its control in Oklahoma Territory, A. McDonald (*U. S. Dept. Agr., Misc. Pub. 301 (1938), pp. [1]+48, figs. 12*).—This publication presents a historical review of erosion in Oklahoma and efforts at its control.

Physical behavior of soils under loading, F. L. Meara (*Soil Sci. Soc. Amer. Proc., 1 (1936), pp. 361–366, figs. 4*).—"It is now possible, with undisturbed samples, to measure in the laboratory the shear and consolidation characteristics of a soil. From these measurements its behavior under a particular loading can be predicted with reasonable accuracy. It must be remembered, however, that no generalizations can be made and that every foundation is an individual problem and must be treated as such."

The influence of soil characteristics on drainage and irrigation practices, W. Gardner. (Utah Expt. Sta.). (*Soil. Sci. Soc. Amer. Proc., 1 (1936), pp. 383–392, figs. 17*).—This contribution presents a mathematical analysis of some of the relations between irrigation and available moisture supply and between drainage, erosion, and flooding. The discussion is based largely upon the Darcy law, originally derived from the movement of water in a horizontal tube filled with homogeneous sand, the velocity of flow having been shown to be "directly proportioned to the difference in pressure head and inversely proportional to the length of the tube, $v=k\frac{(h_1-h_2)}{L}$. In its general form, this law states that the velocity of the percolating stream regarded as a distributed vector point function is directly proportional to the gradient of the aggregate potential, a distributed scalar point function Φ made up of the two terms, p/ρ and ϕ, $\Phi=p/\rho+\phi$, in which p represents the hydrostatic pressure, ρ the density of water, and ϕ the gravity potential. In this more general form, $v=-k\nabla\Phi$, the equation is adapted to a broader application." In the first of these equations h_1, h_2 and L are, respectively, the original and the diminished pressure heads and the distance through which the water moves in the sand.

The behavior of soil materials in water retaining structures, E. W. Lane. (Iowa State Col.). (*Soil Sci. Soc. Amer. Proc., 1 (1936), pp. 367–375, figs. 4*).—The author points out that earth dams and masonry dams on earth foundations depend for their security upon the properties of soils. The failure of such structures is discussed from the point of view of soil behavior, and suitable construction methods are considered.

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Soil characteristics in relation to highway engineering, C. A. Hogentogler and P. Rapp (*Soil Sci. Soc. Amer. Proc., 1 (1936), pp. 377–382, figs. 5*).—The authors discuss eight types of soil tests, as follows: (1) Exploration of natural soil formations; (2) investigation of size, character, and physical properties of soil solids; (3) determination of the physical characteristics of artificial soil-water mixtures; (4) investigation of the properties of densified or compacted soil with or without admixtures; (5) determination of the mechanical properties of soil with natural moisture content and structure; (6) determination of the mechanical properties of soil with disturbed structure but natural moisture content; (7) the flow of gravitational and capillary moisture through soils as they affect the design of drainage systems; and (8) investigations of colloidal surface characteristics. In addition to these tests and other indications, he takes up also a classification based on mechanical analysis and physical characteristics.

The application of base exchange and soil physics to problems of highway construction, H. F. Winterkorn. (Mo. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc., 1 (1936), pp. 93–99*).—This discusses factors influencing the binder qualities of soils, the frost heaving of soils, and bituminous soil stabilization, including soil cohesiveness as affected by water content and the effects of particle size and form and the nature and electrical charges of the exchange ions upon the behavior of the surface films of water. The silica: sesquioxide ratio was found to be a factor in the tensile strength of air-dry soils, experiments with briquets indicating a maximum tensile strength in the soils of equal clay content at a silica: sesquioxide ratio of about 3.2. The physical principles involved in the behavior of soils under freezing conditions are also analyzed in some detail. A briefer treatment of bituminous stabilization is based upon the assumption that "the same facts that govern the movement of water in porous systems like soils hold true for that of other liquids, such as the widely used bituminous materials."

Public Roads, [July 1938] (*U. S. Dept. Agr., Public Roads, 19 (1938), No. 5, pp. [2]+77–99+[1], figs. 8*).—This number of this periodical contains data on State motor-vehicle registrations and receipts for 1937, data on the current status of the various highway and grade crossing projects receiving Federal funds as of June 30, 1938, and the following articles: Accidents on the Road, by S. J. Williams (pp. 77–82); and Segregation of the Various Classes of Traffic on the Highway, by R. E. Toms (pp. 83–93).

A machine for cleaning tobacco seed, L. S. O'Bannon and W. D. Valleau (*Kentucky Sta. Bul. 381 (1938), pp. 101–112, figs. 5*).—The tobacco seed cleaner described is of the blower type and does not employ sieves. It separates heavy and light seed effectively, and has been found satisfactory for cleaning both small and large lots of seed.

The painting of sap buckets and other equipment used in the production of maple syrup, C. O. Willits (*New York State Sta. Circ. 182 (1938), pp. 4*).—Practical information is given on the subject.

Retired refrigerator cars for air- and ice-cooled storage.—A preliminary report, H. A. Cardinell (*Michigan Sta. Quart. Bul., 20 (1938), No. 4, pp. 240–247, figs. 5*).—An account is presented of the securing, equipment, and utilization of an old refrigerator car as a fruit cooling and storage plant. The succession of fruits—cherries, peaches, and apples—were handled profitably.

AGRICULTURAL ECONOMICS

The use of the short-cut graphic method of multiple correlation, W. Malenbaum and J. D. Black (*Quart. Jour. Econ., 52 (1937), No. 1, pp. 66–112, figs. 7*).—The authors state that the essential task of this article is to explore

some difficulties that have arisen in the use of the method of correlation analysis which, since the publication of Bean's article about it (E. S. R., 70, p. 120), has commonly been called the short-cut graphic method. The use of flexible methods is discussed in general under three sets of conditions—"(1) additive relationships and small intercorrelation between the independent variables, (2) additive relationships and much intercorrelation of independent variables, [and] (3) nonadditive relationships."

Income: Selected references on the concept of income and methods of obtaining income statistics, compiled by M. T. Olcott (*U. S. Dept. Agr., Bur. Agr. Econ., Agr. Econ. Bibliog. 73 (1938), pp. IV+48*).—Included are 216 annotated references to publications in English and English abstracts of foreign publications. References on distribution of income, analysis of income, family income and its relation to standard of living, and to purely statistical compilations are not included.

[Investigations in agricultural economics and farm management by the Indiana Station, 1937] (*Indiana Sta. Rpt. 1937, pp. 6, 54–57, 75, fig. 1*).—A table shows the increases in average yields per acre of corn, wheat, oats, and potatoes in the State by decades 1880–1929. Included are brief statements of findings in studies of (1) the effects of farming systems and practices on the returns on from 55 to 60 central Indiana farms in 1930–36, the relative costs for labor, power, and machinery on 200 farms operated with horses and 200 farms operated with tractors and 3 horses or less, and the costs and labor requirements in 1936 in harvesting grain with small combines and the binder-thresher method, all by J. C. Bottum; (2) factors affecting costs of producing winter broilers in 1935–36 on 43 farms, by E. C. Young, M. G. Smith, and D. D. Sutherlin; (3) costs and practices in growing tomatoes in 1936 on northwestern Indiana farms, by L. S. Robertson and Smith; (4) shipments of feeder livestock into Indiana and between counties, by Robertson; (5) desirable soil conservation adjustments on 156 Cass County farms, by Young, Robertson, and M. O. Pence; (6) production of digestible nutrients, carrying capacity, and costs per acre of permanent and rotation pastures in southern Indiana, by F. V. Smith; (7) depreciation rates, repair costs, and value per crop acre of farm machinery on 365 farms, by O. G. Lloyd and Sutherlin; (8) relative average labor incomes, 1929–35, on farms operated under different types of tenure, by Lloyd and J. R. Hays; and (9) the marketing of eggs under United States grades in 1936, by E. R. Menefee.

[Investigations in agricultural economics by the Ohio Station, 1937]. (Partly coop. U. S. D. A.). (*Ohio Sta. Bul. 592 (1938), pp. 75, 111–117*).—In addition to the findings previously noted, included are (1) an economic survey of consumer interest in flowers, by A. Laurie; (2) recommendations as to the transfer of lands now in farms to forestry uses, increase of acreage of hay and rotation pasture, increased use of legumes in meadow and pasture crops, and the exclusion of livestock from woodlands, based on a study by J. I. Falconer; (3) table by F. L. Morrison showing the percentages of farms operated by owners, related tenants, and unrelated tenants in five areas that were and were not maintaining or improving soil productivity; (4) some findings by C. G. McBride as to the effect of milk marketing plans on returns to 107 producers in the Stark County area in 1936 and 1937; (5) a table by R. W. Sherman showing the percentages of milk producers in four Ohio markets making yearly shipments of different amounts in 1930–36, inclusive; (6) findings by C. W. Hauck as to the additional costs, yields, and returns for potatoes on northeastern Ohio farms studied in 1936 where certified and uncertified and treated and untreated seed were used and vines sprayed and

not sprayed; (7) a table by G. F. Henning showing the percentages of farmers interviewed in each of five areas who were influenced by different factors to make their first cooperative shipment of livestock; and (8) table by H. R. Moore showing by areas of the State the number of foreclosures per 1,000 farms during each half-year from July 1933 to June 1937.

[Investigations in agricultural economics at the Ohio Station] (*Ohio Sta. Bimo. Bul. 192 (1938), pp. 98, 110–113, 126*).—Included are tables by J. I. Falconer showing the estimated tons of different commercial feeds reaching the retail trade in Ohio by years 1929–37 (except 1930, 1931, and 1934) and the total sales each year, and a table by F. H. Ballou showing by years 1924–37 the costs of growing, harvesting, marketing, and overhead, the yields, and the average costs per bushel during the period for each item on a 20-acre apple orchard block on very hilly land in central Ohio. The index numbers of production, prices, and income, by Falconer (E. S. R., 79, p. 413) is brought down through March 1938.

Current Farm Economics, [June and August 1938] (*Oklahoma Sta., Cur. Farm Econ., 11 (1938), Nos. 3, pp. 49–70, figs. 8; 4, pp. 71–94, figs. 7*).—In addition to the usual tables of index numbers, No. 3 includes articles on The Wheat Situation for the 1938 Crop (pp. 50–53) and Trend in Production of Oklahoma Farm Commodities, 1910–1937 (pp. 53–59), both by T. R. Hedges, Quality, Yield, and Production of Cotton in Oklahoma in 1937, by K. C. Davis (pp. 60–65), and A History of Wheat Farming in Garfield County, Oklahoma, by P. Nelson and E. A. Tucker (pp. 65–68); and No. 4 includes articles on Should Farmers Store Wheat? by Hedges (pp. 72–76), Revolving-Fund Financing for Cooperative Gins, by O. T. Weaver (pp. 76–81), Beef Cattle—1938–39 and Immediate Future, by Hedges and P. Nelson (pp. 81–88), and Improving Rental Agreements as a Means of Encouraging Development of a Permanent Agriculture, by S. B. Schneider and H. A. Graham (pp. 89–92).

Land economics, R. T. Ely and G. S. Wehrwein (*Ann Arbor, Mich.: Edwards Bros., 1938, rev. ed., pp. [3]+166 [fig. 1]*).—This is a revised edition of the textbook previously noted (E. S. R., 61, p. 285). The following subjects are included: The field of land economics and the classification of land, the property concept in land economics, characteristics of land and landed property, population and land, the utilization of land, agricultural land, the utilization of the arid lands, forest and cut-over land, recreational land, water resources, mineral and power resources, and urban land.

[Land use planning] (*Resettlement Admin. [U. S.], Land-Use Planning Pubs., 1936, Nos. 1, pp. [2]+II+44; 2, pp. [1]+II+17, pl. 1, fig. 1; 3, pp. [1]+20; 4, pp. [3]+63; 4a, pp. [4]+94; 5, pp. [1]+II+84; 6, pp. [1]+27, figs. 6; 7, pp. [1]+5, pls. 2; 8, p. [1]+II+25, figs. 4; 9, pp. [1]+II+47; 10, pp. [3]+I+67; 11, pp. [3]+II+48; 1937, Nos. 12, pp. [3]+44; 13, pp. [1]+VII+108; 14, pp. [3]+109; 15, pp. [3]+23; 16, pp. [1]+VI+60, pls. 26; 17, pp. [1]+9, pl. 1; 18a, pp. [1]+III+96, pls. 3; 18b, pp. [1]+II+27*).—This is a series of mimeographed publications as follows: Nos. 1, Land Classification—Objectives and Requirements, by C. P. Barnes; 2, Present Land-Use Mapping—Methodology Used by High School Students, State of Washington, 1936, by E. F. Landerholm and C. E. Johnson; 3, Supplementary Farming Homesteads in Recent German Land Settlement, by E. Kraemer; 4, Agricultural Landlord-Tenant Relations in England and Wales, by M. Harris; 4a, Reprint of No. 4 and Scotland's Activity in Improving Farm Tenancy, by M. Harris and D. F. Schepmoes; 5, Land Settlement Technique Abroad—III, Selection of Settlers in Agricultural Settlement of Several European Countries, by E. Kraemer; 6, The Utilization of Aerial Photographs in Mapping and Studying Land Features, by T. P. Ahrens; 7,

Present Land Use in Morton County, North Dakota—A Comparison of Mapping Methods, by C. H. Plath; 8. Land Classification as a Basis for Land Appraisal and Equalization of Tax Assessments—Report on the Land Classification Study in Nevada Township, Story County, Iowa, by A. J. Englehorn; 9, Problems of Land Tenure in Relation to Land-Use Adjustments, by R. Schickele and J. P. Himmel, in cooperation with the Iowa Experiment Station; 10, Problems and Suggestions in the Drafting of Rural Zoning Enabling Legislation, by H. Walker, Jr.; 11, Some Considerations in Support of the Constitutionality of Rural Zoning as a Police Power Measure, by H. Walker, Jr.: 12. Isolated Settlement and Tax-Delinquent Land in Northern Minnesota; 13, A Summary of Existing Rural Land Use Legislation in Minnesota, by O. C. Peterson and E. C. Norberg; 14, Compensation as a Means of Improving the Farm Tenancy System, by M. Harris; 15, Recent Policies Designed to Promote Farm Ownership in Denmark, by E. R. Hooker; 16, An Approach to Area Land Use Planning (With Particular Reference to Technique and Procedure), by M. H. Saunderson, R. B. Haight, E. M. Peterson, and R. E. Willard, in cooperation with the Montana Experiment Station; 17, Recent Trend Toward Diversified Farming in Southern Cotton Areas, by H. I. Slentz; 18a, Public Finance Aspects of the Milk River Land Acquisition Project (LA-MT-2), Phillips County, Montana, by J. J. Haggerty; and 18b, General Framework of Law and Procedure Within Which Local Governments Operate in Montana (Background Study to Accompany 18a), by J. J. Haggerty.

Agricultural adjustment research. (Coop. U. S. D. A.). (*Georgia Sta., 1936, pp. [5]+67, fig. 1*).—The agricultural census data for 1930 is tabulated by the nine type-of-farming areas of the State, and tables are included showing the proposed changes in land utilization, livestock, crops, and population in each area.

Reports Arizona State Planning Board, II (*[Phoenix]: Ariz. State Planning Bd., 1936, vol. 2, pp. [7]+359, [figs. 32]*).—Included are reports on land use problem areas of the State as follows: Irrigated farm areas (pp. 1–38), revision and refinement of Arizona problem area map and designation of settlement areas (pp. 89–138), and the Safford Valley (pp. 139–159), all by G. E. P. Smith and W. A. Steenbergen, and nonirrigated farm areas, forest, range, watershed, game, recreation, and desert areas, by W. G. McGinnies (pp. 39–87); a report on the water supply of the State, by S. K. Baker (pp. 161–231); and the reports of the committees of the Arizona Section of the American Society of Civil Engineers on flood control and power (pp. 233–359).

An economic study of land utilization in Clinton County, New York, O. H. WHITE (*[New York] Cornell Sta. Bul. 689 (1938), pp. 52, figs. 22, map 1*).—This is the twelfth bulletin in the series previously noted (E. S. R., 79, p. 121) and follows the same general plan in describing the agricultural history, land uses, land classes, soils, farm buildings, real estate values, dairy industry, development of resources, etc., in Clinton County.

Farm adjustments in Saluda County, South Carolina, M. C. ROCHESTER and O. STEANSON. (Coop. U. S. D. A.). (*South Carolina Sta. Bul. 315 (1938), pp. 80, figs. 5*).—A field study of 52 selected above-average farms was made for the crop year 1935. The factors—climate, topography, soils, soil erosion, and boll weevil—affecting the agriculture of the county are described. The past and present organization of the farms studied is discussed and an analysis made of the classes of land, crops grown, crop rotations, crop yields, production factors and financial outcome of the crops, yield of cotton and financial outcome of cotton, livestock enterprises, farm labor, investment, income, labor relationships, characteristics of successful farms, etc. The outlook for different farm

products of the county is discussed, and plans of organization for farms of different sizes and types are suggested with estimated estimates of investment, farm expenses, and returns.

The average labor income on the 52 farms varied from $548 for the highest 13 to —$388 for the lowest 13. For the farms having 40 percent or more of the cultivated land in cash crops the average labor income was $693 as compared with $7 for those with from 30 to 39 percent, —$24 for those with from 20 to 29 percent, and —$90 for those with 19 percent or less. The average labor income was —$151 for farms with 30 acres or less of cultivated land, —$118 for those with from 31 to 75 acres, $293 for those with from 76 to 150 acres, and $73 for those with 151 acres or over, the average for all farms being $22.

Changes in technology and labor requirements in crop production: Sugar beets, L. K. Macy, L. E. Arnold, E. G. McKibben, and E. J. Stone (*Philadelphia: Works Prog. Admin.* [*U. S.*], *1937, pp. XV+48,* [*pls. 6*], *figs. 5*).—*This report is the first of a series being prepared under the direction of* J. A. Hopkins on changes in technology and labor requirements in crop production since 1909. The acreage, production, and yields; improvements in varieties and principal changes in cultural methods; mechanical equipment; and labor utilization are discussed.

Changes in farm power and equipment: Mechanical cotton picker, R. L. Horne and E. G. McKibben (*Philadelphia: Works Prog. Admin.* [*U. S.*], *1937, pp. XI+24, figs.* [8]).—This is the second report of the series noted above. Different types of pickers are described, and estimates as to costs, losses, etc., based on experimental machines in use are included. The probable effects of a successful picker on labor, size of farms, etc., are discussed.

Principal farm products—agricultural income inquiry (*U. S. Senate, 75. Cong., 1. Sess., Doc. 54* (*1937*), *pp.* III+*40*).—This is volume 1 of the report of the Federal Trade Commission, submitted in pursuance to Public Resolution No. 61, 74th Congress. Chapter 1 includes the findings as to changes in the income of farmers and manufacturers and distributors of farm products; distribution of the consumers' dollar; extent of control and monopoly of the manufacturing and marketing of major farm commodities; methods of obtaining control; cooperatives; growth in capitalization and assets; investments, earnings, and rates of return; channels of supply and distribution, etc., of companies handling agricultural products; tax avoidance; salaries of corporation officers; terminal grain markets and the marketing of grain; and cotton markets and marketing. Chapter 2 includes the conclusions and recommendations as to monopolistic tendencies, unbalanced relations between industry and agriculture, cooperative associations, and recommendations with special reference to the grain trade, cotton trade, milk and milk products, tobacco, and potatoes.

Fruits and vegetables—agricultural income inqniry (*U. S. Senate, 75. Cong., 1. Sess., Doc. 17* (*1937*), *pp. V+16*).—This is a letter from the chairman of the Federal Trade Commission, submitting an interim report on fruits and vegetables. The origin, scope, and progress, etc., of the inquiry made under Public Resolution Nos. 61, 86, and 112 of the 74th Congress are stated, and conclusions and recommendations of the Commission as to terminal market inspection, loss and damage claims, unfair rejections, failnre to account properly to shippers, misbranding, terminal cartage and facilities, and cooperative marketing are given.

An economic study of potato production in New Brunswick, I. S. McArthur (*Canada Dept. Agr. Pub. 562* (*1937*), *pp.* [*2*]*+70, figs. 3*).—This bulletin reports the findings in a comprehensive farm survey made in Carleton and Victoria Counties to determine the relationship of the potato enterprise to the

balance of the farm business and to determine the costs involved in producing potatoes. In July and August 1935, 202 farm survey records covering the 1934–35 crop year were collected. In 1936, 70 records were also secured from the same farmers covering the 1935–36 crop year.

Brief facts on tobacco farming in Puerto Rico in 1935–36 and 1936–37, E. DEL TORO, JR. (*Puerto Rico Col. Sta. Mimeogr. Rpt. 11 (1938), pp. [1]+15, figs. 2*).—Data regarding 194 selected farms, 1935–36, and 270 farms, 1936–37, are analyzed to show the use of land, distribution of capital, crop acreages, yields, and sales, numbers of different kinds of livestock, farm expenses, labor expenses, labor income and factors affecting it, tenure of operators, and the debt situation.

Cost and efficiency in the filbert enterprise in Oregon, A. S. BURRIER and C. E. SCHUSTER. (Coop. U. S. D. A.). (*Oregon Sta. Bul. 351 (1937), pp. 60, figs. 9*).—This bulletin analyzes the costs of growing a filbert orchard to bearing age (6 yr.) and the production of filberts from bearing orchards and the factors affecting each. The data on orchard growing costs cover the period 1928–34 and those for producing filberts the 1932 and 1933 crops. Fifty bearing orchards and 20 young orchards were included in the study.

The net average cost per acre of a young orchard—first 5 yr.—was $164 for land and $153 for growing costs. Of the growing costs, $58.83 was direct cash expenditure. Of the total cost, man labor comprised 24.3 percent, horse work 3.1, trees 24.3, materials and miscellaneous items 12.4, depreciation of equipment 3.1, and interest on land, equipment investment, and accrued growing costs 32.8 percent. The planting system and value of unplanted land were major factors affecting the costs. The average costs of producing filberts were $52.37 per acre or 13.2 ct. per pound in 1932 and $59.29 per acre or 7.5 ct. per pound in 1933. Of the principal costs, man labor comprised 31.9 percent, horse work 2.1, materials and miscellaneous items 9.6, depreciation of equipment 3.4, and interest on investment 53 percent. Cash costs amounted to $17.57 per acre and non-cash costs to $41.72. Yield per acre and prices received were the major factors affecting profits. "The outlook for profits in the filbert enterprise indicates that future market values for bearing orchards may tend to approach the cost of establishing these orchards. This indicates that lower interest costs are probable."

Regional development of hog production in Kentucky, C. D. PHILLIPS (*Kentucky Sta. Bul. 380 (1938), pp. 73–100, figs. 12*).—This bulletin gives a brief history of hog production in the State and describes and discusses the cash and farm income received from the hog enterprise, grades of hog marketed in different sections of the State, market outlets, prices, price trends, and cycles and hog-corn price ratios.

Effect of changes in milk and feed prices and in other factors upon milk production in New York, M. S. PARSONS ([*New York*] *Cornell Sta. Bul. 688 (1938), pp. 67, figs. 26*).—This statistical analysis was made to determine the long- and short-time responses in milk production to changes in certain factors, particularly prices of milk and feed, and to develop more satisfactory methods for forecasting milk supply. Two series of production data were used. The first covering 1910–36 pertained to deliveries by all producers at 28 plants scattered throughout the State and the second covering 17 plants for the period 1921–36 included data for a number of continuous producers and butterfat tests. The price data included milk prices paid producers and the prices of items entering into production, such as grain, hay, and labor. Other data included information on season of freshening, cattle numbers, pasture conditions, and weather. The study of the long-time effect is concerned with the relation

of the milk-grain ratio and milk production per dairy. The study of short-time effect is confined to the effect of milk prices, grain prices, and the milk-grain ratio. In both studies analyses are made to show the production response for the whole State and for different sections of the State, the response by large and small producers, and the methods of response. In the long-time study the butterfat-production response and in the short-time study the effect of previous price changes are also analyzed. The effects of pasture conditions, crop yields, and weather on production, and the use of long- and short-time relationships of the milk grain ratios and cow numbers and season of freshening in forecasting the supply of milk are discussed.

The linear correlation coefficients of relationship of milk production and best fitting milk-grain ratio period for all months 1914–36 ranged from +0.69 to +0.94 except for June (+0.61) and July (+0.55). For the period 1910-36 the coefficients ranged from +0.45 to +0.87. For the State as a whole, production lagged 2 yr. in the response to changes in the price ratio. Production from January through July followed most closely the price ratios for February and March. Fall production showed the greatest response to August and September price ratios. The production response to the milk-grain price ratio in some areas differed considerably from that for the State. The response for continuous producers delivering to a group of country plants was practically the same as that based on average production per dairy for all producers delivering to the same plants. The butter-fat response to the price ratio was not materially different from that for milk. Large producers made a more pronounced long-time response than did small producers. The short-time production response to the milk-grain price ratio usually lagged from 1 to 4 mo. and was highest during the winter and spring months. It showed no trend over the period 1911–35. It appeared to be slightly higher in years of low prices than during years of high prices, and was greater when the price ratio had decreased from the previous month. The price of grain seemed to have had a greater short-time effect on production than the price of milk. Large producers made a greater response than small producers. The response was brought about largely by changes in feeding and care and modifications in the culling system. Pasture conditions, crop yields, and weather had little effect on monthly volume of production. "Estimates of monthly production from the long-time and short-time price-production relationships were within 5 percent of actual production most of the time. The long-time estimates were more nearly accurate. With the data available, production estimates based on cow numbers and season of freshening were of little value."

Economic survey of sixty dairy farms in Puerto Rico for the fiscal year 1935–36 [trans. title], R. Huyke (*Puerto Rico Col. Sta. Bul. 45 (1938), Span. ed., pp. [1]+51, figs. 7*).—Data were obtained from 30 farms for the year ended June 30, 1936. The areas and the size, capital invested, crops produced, production of livestock, dairy animals, milk, etc., are described and discussed. An analysis is made of the relations to returns of acreage cropped, amount of labor used, number of cows, production per cow, etc. Suggestions are included as to improvements in organization to secure higher returns.

The average size of the farms studied was 248.2 cuerdas (244 acres), of which 65.1 cuerdas were in crops and 166.5 in permanent pasture. The average capital was $57,976. The average number of cows per farm was 81. Milk sales per farm averaged 125,341 qt., with a total value of $11,958. The average expenses per farm were $9,859, exclusive of rent. Labor incomes ranged from —$2,551 to $10,565, averaging $2,569. Labor income increased as size of farm and number of man equivalents employed increased. The farms with the larg-

est number of cows had the highest labor income and those with the least number of cows the next highest income. Labor income increased with production per cow. Amount of milk handled per cow had no consistent relationship to labor income. The highest labor income was on the farms having the lowest percentage of receipts from crops, and the second highest from those having the highest percentage of receipts from crops. Farm tenure did not affect labor income significantly. Middle-aged farmers had the highest labor income. Farms selling their milk at wholesale had the lowest labor income. The following relationships to labor income were found: One cuerda increase in size of farm, $9 increase in labor income; 1 cow more per farm, $30 increase in labor income; increase of $1 in milk sold per cow, $29 increase in labor income per farm; and increase of 100 qt. of milk per cow, $198 increase in labor income. The farms having number of cows, value of milk sales per cow, and 100 qt. of milk handled per man and per man equivalent above the average had labor incomes of $8,550 per farm.

Vermont milk report (*[Montpelier]: Spec. Milk Invest. Com., 1937, pp. [43, pl. 1, figs. 8]*).—This is the report of the special milk investigational committee appointed by the Governor. Facts regarding the production, disposal, prices, etc., are presented and recommendations made.

Milk investigation scheme: Costs of milk production in England and Wales.—Interim report No. 1 (*Oxford: Univ. Oxford, Agr. Econ. Res. Inst., 1937, pp. 87, fig. 1*).—This is an interim report covering the period November 1, 1934, to September 30, 1935. Milk was the chief source of income on 91 percent of the 631 farms cooperating in the study. General information is given regarding the farms; the costs on the wholesale, intermediate, graded, and producer-retailer farms are discussed; and an analysis is made of the costs on wholesale farms.

A history of the New Zealand dairy industry, 1840–1935, H. G. Philpott (*Wellington: Govt., 1937, pp. [3]+413, [pls. 38]*).—This is a history of the industry in New Zealand and a handbook of information for dairymen.

Farm organization in the Portales pump-irrigated area: A description of the area and a brief analysis of the systems of farming, costs, and farm organization problems, P. W. Cockerill (*New Mexico Sta. Press Bul. 854 (1938), pp. [1]+17*).—The extent, physical features, climate, soils, water supply, etc., of the area are described, and a brief analysis is made of the farming systems, costs of pumping water and producing crops, the returns, farm income, etc., as shown by farm business records and survey records for approximately 40 farms for the year 1933–34, inclusive. The agricultural problems of the area are discussed.

Farm organization in the Deming pump-irrigated area: A description of the area and a brief analysis of the systems of farming, costs, and farm organization problems, H. B. Pingrey (*New Mexico Sta. Press Bul. 855 (1938), pp. [1]+22, pl. 1*).—This study is similar in scope to that noted above.

Regional types of British agriculture, edited by J. P. Maxton (*London: George Allen & Unwin, [1936], pp. 318, [figs. 18]*).—Included are 15 articles by 15 different authors on the farming in the different regions of Great Britain.

Farm tenure in Iowa.—V, Some legal aspects of landlord-tenant relationships, M. Harris, A. H. Cotton, and R. Schickele (Coop. U. S. D. A.). (*Iowa Sta. Bul. 371 (1938), pp. 63, figs. 2*).—This bulletin continues the series previously noted (E. S. R., 78, p. 715). It presents information as to the more important laws of Iowa concerning agricultural landlords and tenants. It describes the legal status of landlords and tenants and makes comparisons with

other States. Some of the legal, economic, and social consequences of the present laws and possible statutory adjustments are discussed. Appendixes discuss some of the experiences in England and Wales, Scotland, the Netherlands, Denmark, and other countries in regulating landlord-tenant relationships; and include excerpts from the Agricultural Holdings Act of England and Wales, 1923, and the major constitutional provisions and statutes of Iowa pertaining to tenancy.

Report of the committee on land tenure and farm debt structure in Minnesota (*[St. Paul]: Minn. State Planning Bd., 1937, pp. [XXVIII]+126, pls. [17]*).—Included are (1) the full report of the committee presenting data as to land occupancy and ownership, leasing practices, tenure of tenants, present composition and trends of farm indebtedness, and remedial measures; (2) a brief summary report, with the recommendations of the majority of the committee; and (3) the statements of minority members of the committee.

Comparative cost of bank and production credit association credit, R. J. Burroughs and F. A. Voss (*Michigan Sta. Quart. Bul., 20 (1938), No. 4, pp. 233–239*).—The costs of credit obtained from banks and from production credit associations are compared, and an explanation is made of how the farmers may calculate the relative costs in individual cases.

Fourth annual report of the Farm Credit Administration, 1936 (*Farm Credit Admin. [U. S.] Ann. Rpt., 4 (1936), pp. VI+215, figs. 31*).—This report covers the operations for the year 1936 of the Federal land banks, national farm loan associations, production credit corporations, production credit associations, banks for cooperatives, Federal intermediate credit banks, Federal farm mortgage corporation, emergency crop and feed loan offices, agricultural credit corporation stock purchase loans, organizations in liquidation, regional agricultural credit corporations, Agricultural Marketing Act revolving fund, joint stock land banks, and the Washington office of the Administration.

Taxation in rural Ontario, S. C. Hudson (*Canada Dept. Agr. Pub. 489 (1936), pp. 32, figs. 3*).—The purpose of this study was "to provide a group of factual data along with contributory factors concerning the rural tax situation in Ontario." A brief historical review of the municipal government of the Province is given, and the municipal taxation system and municipal-provincial financial relationships are described. An analysis is made of the farm tax situation and distribution of the farm tax burden.

Farm taxes in 1929–31 made up about 6.5 percent of the total current expenses on the orchard farms studied. The index of farm taxes (1926=100) increased from 29.2 in 1906 to 115.8 in 1930 and then declined to 89.1 in 1933. From 1914 to 1932 township bonded indebtedness increased over 600 percent and county bonded indebtedness about 350 percent. During the period 1901–31 farm taxes for all purposes increased. The proportion levied for school and township purposes declined materially, and that for county purposes increased greatly. The increase of farm taxes in representative rural municipalities was due principally to the rapid development of highways since 1917. Increased expenditures for school and welfare services were also important factors. The study of 733 farms showed that those having incomes of $1,000 or less paid over 30 percent of the income in taxes, while those with incomes of $3,000 or more paid less than 5 percent. The average ratio of assessed to estimated valuation for 246 farms varied from 22 to over 70 percent. There was a distinct tendency to over-assess low-valued farms, and the assessments were also less accurate.

Agricultural labor in the United States, 1936–1937: A selected list of references, compiled by E. M. Colvin and J. C. Folsom (*U. S. Dept. Agr., Bur. Agr. Econ., Agr. Econ. Bibliog. 72 (1938), pp. VII+205*).—This bibliography

covers the years 1936 and 1937 and supplements the one previously noted (E. S. R., 75, p. 556). New sections, including ones on health and nutrition, peonage, and unemployment relief and rehabilitation are added. A list entitled Some Periodicals Relating to Agricultural Labor is also included.

Selected references on practices and use of labor on farms, I, II, compiled by W. A. Newman and L. K. Macy (*Philadelphia: Works Progress Admin. [U. S.], 1937, pts. 1, pp. VII+284; 2, pp. VII+285-495*).—References are included in these two volumes to bulletins, pamphlets, mimeographed reports, and unpublished data of the U. S. Department of Agriculture and State experiment stations. The references are divided into five main groups—crops, fruits and vegetables, and livestock included in part 1, and implements and operations and seasonal distribution of labor included in part 2.

Hired labor requirements on Arizona irrigated farms, E. D. Tetreau. (Coop. U. S. D. A. et al.). (*Arizona Sta. Bul. 160 (1938), pp. 183-217, figs. 4*).—Field surveys were made in 1936 covering the labor requirements for 1935 on 42 farms in the upper Gila, 522 in the Salt River, 43 in the Casa Grande, and 63 in the Yuma-Gila valleys. The farms studied included slightly less than 10 percent of the area in irrigated farms in the valleys. The methods used in the study are described, and a copy of the schedule used is included.

In 1935 more than 4,400,000 man-days of hired labor costing almost $7,000,000 was required in the four valleys, of which 69.1 percent was seasonal and 30.9 was hired by the month or year. The percentages varied from 64.4 and 35.6, respectively, in the Salt River Valley to 85.3 and 14.7, respectively, in the Casa Grande Valley. The total seasonal labor required varied from 89,000 man-days during March to 558,000 during November. The most extreme variations were in the upper Gila Valley—a cotton, alfalfa, grain, and dairy products area—and the least in the Salt River Valley—a cotton, alfalfa, beef cattle, dairy products, truck crops, grain, and citrus fruit area. Monthly distribution for different crops varied greatly, and the distribution for the same crop varied from year to year. Costs per man-day increased toward the west, being $1.29 in the upper Gila Valley, $1.65 in the Salt River Valley, and $1.87 in the Yuma-Gila Valley. The estimated total labor requirements and costs for 1936 were 5,250,000 man-days and $9,000,000, and for 1937, 5,709,000 man-days and $10,600,000. The increases in the amount of regular labor were 5 percent over the previous year and in the amount for seasonal labor 25 percent over 1935 and 10 percent over 1936. Rates of pay were increased about 9 and 7.5 percent for regular labor and 10 and 10 percent for seasonal labor from 1935 to 1936 and from 1936 to 1937.

Wages, employment conditions, and welfare of sugar-beet laborers, E. S. Johnson (*U. S. Dept. Labor, Bur. Labor Statis., Mo. Labor Rev., 46 (1938), No. 2, pp. 322-340*).—This article summarizes the findings in various Government inquiries regarding child labor, school attendance, duration of work, wage rates, yearly earnings, relief, living conditions, etc.

Labor organization in agricultural America, 1930-35, S. C. Sufrin (*Amer. Jour. Sociol., 43 (1938), No. 4, pp. 544-559, fig. 1*).—"This paper is concerned with a portrayal and analysis of the conditions which (1) have brought about the sudden growth of farm labor unions and (2) have limited the new union movement to the migratory fruit and vegetable workers in America. . . .

"In addition to falling wages, organization of agricultural unions is facilitated by racial homogeneity of the workers, or conflicts between races, and especially upon gang (rationalized) labor or production methods. . . . Industrial experience or a leadership versed in the technics used by industrial labor leaders is important." The author states that the sudden interest in working con-

ditions and wages can probably be ascribed to the depressed condition of the incomes of these farm workers and the propaganda for unionization and organization resulting from New Deal policies.

Forests and employment in Germany, W. N. SPARHAWK (*U. S. Dept. Agr. Circ. 471* (*1938*), *pp.* [*2*]+*52*).—"This study was undertaken for the purpose of learning the extent to which the German forests afford work opportunities, particularly for rural people." The volume of employment and workers' wages and working conditions in different parts of Germany, kinds of work, periods of employment, employment policy, training of workers, etc., are discussed. Appendixes include examples of the employment afforded regularly and for relief of unemployment in different sections of Germany and in Austria.

Foreign Agriculture, [**July 1938**] (*U. S. Dept. Agr., Bur. Agr. Econ., Foreign Agr., 2* (*1938*), *No. 7, pp. 303–350, figs. 17*).—Included are articles on The Hog Industry in the Netherlands, by H. E. Reed (pp. 305–322), and Argentine Wheat, by P. O. Nyhus (pp. 323–348), and notes on recent developments in foreign agricultural policy as follows: Hungary inaugurates five-year plan, Mexico to regulate food prices, and New Zealand establishes citrus fruit monopoly.

Import quotas in the United States, C. R. WHITTLESEY (*Quart. Jour. Econ., 52* (*1937*), *No. 1, pp. 37–65, figs. 2*).—The quotas established, the administrative provisions, size of quotas, etc., are described, and the effects of such quotas are discussed.

Marketing the late crop of potatoes, J. W. PARK (*U. S. Dept. Agr. Circ. 475* (*1938*), *pp. 67, figs. 17*).—The late potato areas of the United States and the handling and marketing practices in each, and the important city potato markets are described. More general descriptions are included of the recent developments in marketing late potatoes, utilization of the crop, grading, storage, shrinkage, shipments by different means of transportation, competition beween areas, distribution of shipments, futures trading, foreign trade, prices in producing areas and city markets and for certified seed potatoes, etc.

From 1922–26 to 1932–36 there was a notable increase in the production of late potatoes in Maine and Idaho and a decrease in the Midwestern surplus States. Yearly fluctuations in size of crop were due more to acreage changes than to acre variations. About 30 percent of the production of the 30 late-crop States was shipped in carlots or by boat, about 35 percent in trucks, and the remainder was saved for farm use or was unfit for food. Bruises and cuts are the most common defects of late-crop potatoes. Developments in marketing in recent years included a moderate use of small sacks and the use of brushing and washing machines. About 58 percent of the carlot shipments in 1935–36 were inspected at the shipping point by Federal-State inspectors. Most of the late potatoes are harvested in September and October and marketed until June. Competition from early-crop potatoes is not very significant until April, but in May shipments of early potatoes increase and exceed those of late potatoes. Prices of late-crop potatoes are influenced largely by size of crop and the general price level.

Retail marketing of apples by a chain store warehouse in Philadelphia, H. S. GABRIEL (*Delaware Sta. Bul. 208* (*1938*), *pp. 43, figs. 6*).—Part 1 of this study is based on records as to the quantities sold and prices of 10 varieties of apples sold by a selected warehouse from April 13, 1933, to December 7, 1935. Part 2 is based on records for the period from September 9 to December 7, 1935, from 5 retail stores in a well-to-do, an industrial, a Negro, a Jewish, and an Italian community in the chain served by a central warehouse in Philadelphia serving northern Delaware and nearby sections of New Jersey and Pennsylvania. Part 3 is based on records of sales of oranges, bananas, grapefruit, peaches, pears, and plums for the same period as that included in part 1.

Apples were sold from the warehouse throughout the entire year, the lowest volume being in June and the highest in October. Retail prices changed on an average of once every week and a half, the average change being between 30 and 40 ct. per bushel. Western boxed apples usually sold for a higher price than eastern apples in bushels. The spread between the local wholesale price and the retail price charged by the warehouse was approximately 40 percent of the retail price for most varieties. Hallowe'en, Thanksgiving, and Christmas decidedly increased the volume sold during the previous week. Stores catering to well-to-do trade handled the most expensive apples, those to the Italian trade the second most expensive, and those to Negroes cheaper apples than in the case of the other types of stores. Stores catering to the poorer people sold from one-half to three-fourths as many bushels of oranges as of apples, while those in the wealthy sections sold 2½ times as many. Bananas sold in larger quantities than any other fruit except oranges and were sold more uniformly throughout the year than apples. Grapefruit ranked fourth in the volume of sales. Peaches were next as a competitor for apples, and during July and August the sales were double those of apples. The peak month sale for peaches was as high as the peak month sale for apples. Pears, although sold the year round, were sold mainly in the summer and chiefly to wealthy people. Plums were the most expensive fruit studied and were sold almost entirely in the well-to-do sections.

Commercial trucking of fruits and vegetables in nine Atlantic Coast States, N. Fogelbert and H. W. Mumford, Jr. (*Farm Credit Admin. [U. S.], Coop. Div., Bul. 17 (1937), pp. IV+60, figs. 18*).—This bulletin was prepared for the use of farmers' cooperative associations. It discusses the methods of shipping fruits and vegetables, transportation rates by rail and truck, nature and availability of truck services, and the costs of operating trucks and the factors affecting these costs. The average cost of operation during the year ended June 30, 1934, for 757 motortrucks studied was 10.6 ct. per fruit-and-vegetable mile, or 3.8 ct. per ton-mile. The cost per ton-mile ranged from 1.2 to 34.7 ct. The cost for trucks with a total mileage of from 15,000 to 29,999 miles was 1.173 ct. less than that for trucks with a mileage under 15,000 miles. For trucks carrying from 5 to 5.9 tons it was 0.363 ct. less than for those carrying loads of from 4 to 4.9 tons. The cost for 2 tons rated capacity was 1.28 ct. higher than for 1.5-ton trucks. Country shippers were divided as to the desirability of truck transportation, but the majority believed the advantages outweighed the disadvantages.

Transportation of milk and cream to Boston, A. J. Pollard (*Vermont Sta. Bul. 437 (1938), pp. 42, figs. 12*).—The Boston milk and cream sheds and the relative importance of various areas and the methods of transportation from them are described. Various methods of transportation are compared as to rates and services, and a check is made of the Federal reports of the milk and cream receipts in Boston. The study is based chiefly on records of monthly shipments from all country points during the period from December 1935 to November 1936, inclusive.

In 1936 Vermont supplied about 50 percent of the milk and cream shipped to Boston. Massachusetts, Maine, New Hampshire, eastern New York, and Rhode Island supplied most of the balance of the milk, and the largest shipments came from the area between 160 and 240 miles from Boston. Between 1926 and 1936 the receipts increased about 8 percent, the number of shipping points decreased, and the proportion of milk originating at points less than 200 miles from Boston increased. The balance of the cream shipments in 1936 came from New York, a section of Canada, and parts of 10 Midwestern States, 32 percent coming from the Western States. The heaviest eastern shipments came from a distance

of from 200 to 280 miles from Boston. Seasonally the shipments varied greatly both as to amount and source. Practically all shipments in the spring were from the eastern area, while in November over 50 percent were from the West. Seventy-three percent of the milk and 85 percent of the cream were shipped by rail. Rail shipments originated largely in the area from 160 to 240 miles from Boston, and truck shipments were more important only from the area within 80 miles. Of the shipments by rail, approximately three-fourths of the milk was handled in tank cars, one-fifth in carlots in cans and bottles, and the remainder in less-than-carlots. Of the cream, two-thirds was shipped in carlots and one-third in less-than-carlots.

From 1926 to 1936 milk shipments shifted from less-than-carlots to tank car, carlot, and truck shipments. Carlot shipments of cream increased due to the increased shipments from the West, and shipments by truck from eastern points were developed. Weekly reports of receipts of milk and cream by the U. S. D. A. Bureau of Agricultural Economics were fairly accurate for rail shipments, but in 1936 the reported truck receipts were equivalent to only 62 percent of the volume of milk and 46 percent of the volume of cream received by trucks.

Transportation of milk in the Philadelphia milkshed, J. J. Scanlan (*Farm Credit Admin. [U. S.], Coop. Div., Bul. 13 (1937), pp. IV+151, figs. 38*).—This study was made primarily in relation to milk transportation as it pertains to the operations of the Inter-State Milk Producers' Association, Inc., which controls over 50 percent of the milk in the Philadelphia milkshed. General information and statistical data were obtained from Federal departments; State departments, commissions, institutions, etc.; railroads; trucking associations; etc. Three hundred producers in 13 areas of the milkshed furnished information as to local hauling to the country plants. Twenty-two haulers, operating 130 trucks, were interviewed to determine the costs of hauling milk direct from farms and from receiving plants, and hauling-cost data were obtained from truck manufacturers, cooperative associations, and State and Federal agencies. Historical data and information relative to shipments, hauling agencies, changes in hauling methods, charges, etc., were obtained from 28 of the more important dealers in the metropolitan Philadelphia market. A special questionnaire was used to collect data from more than 20 large cooperative milk associations. The Philadelphia milk market and milkshed; the facilities for milk transportation; growth and decline of receiving stations; local hauling, including effects on producers of receiving station closures, hauling agents, charges and income, cost of operating trucks, etc.; hauling from receiving stations, including volume of shipments, methods of transportation, freight rates, costs, etc.; direct hauling, including area involved, charges, costs, etc.; reorganization of assembly; and cooperative hauling are discussed.

Cooperation in agriculture, compiled by C. Gardner (*Farm Credit Admin. [U. S.], Coop. Div., Bul. 4 (1936), pp. III+214*).—This is a selected and annotated bibliography of nearly 1,000 references, with special reference to marketing, purchasing, and credit. A selected list of periodicals issued by educational, marketing, and purchasing associations is also included. The references are indexed by subject, author, and country or State.

Organization and operating problems of Nebraska cooperative creameries, T. G. Stitts and G. C. Laughlin (*Farm Credit Admin. [U. S.], Coop. Div., Bul. 11 (1937), pp. IV+56, figs. 5*).—This bulletin is based upon a survey made in 1935 and is concerned primarily with local cooperative creameries. "The study may be divided into the following sections: (1) Consideration of the place of the cooperative creameries in the dairy industry of the State; (2) an outline of the development of the local cooperative creameries; (3) an appraisal of the creameries as cooperative institutions in relation to various cooperative 'stand-

ards'; (4) an appraisal of the creameries as operating units; [and] (5) recommended adjustment both as to commercial operations and cooperative organization."

Consumers' co-operation in Great Britain: An examination of the British Co-operative Movement, A. M. CARR-SAUNDERS, P. S. FLORENCE, and R. PEERS (*London: George Allen & Unwin, [1938], pp. 556, [pl. 1], figs. [8]*).—The parts of this book deal with the historical background, the structure of the cooperative movement, cooperative democracy, problems of cooperative enterprise, and the social significance of cooperative enterprise.

The first world agricultural census (*Internatl. Inst. Agr. [Roma], First World Agr. Census Buls. 7 (1936), pp. 63; 10, pp. 51; 18, pp. 55; 22, pp. 15; 27, pp. 24; 28, pp. 31*).—These bulletins continue the series previously noted (E. S. R., 78, p. 877). No. 7 presents data for Latvia, No. 10 for Lithuania, No. 18 for India, No. 22 for Mauritius, No. 27 for England and Wales, and No. 28 for Scotland.

Farm accountancy statistics for 1931–32, 1932–33, and 1933–34, A. BRIZI (*Inst. Internatl. Agr. [Roma], Comptab. Agr. Rec. Statis. 1931–32, pp. XXVI+255; 1932–34, pp. XXII+105*).—These are the fifth and sixth volumes of the series previously noted (E. S. R., 73, p. 120). Each includes accountancy results in respect to 17 European countries. The first also includes the results for the Province of Punjab, India, and the second for Illinois, Michigan, Indiana, and Iowa. The plan for presenting the data has been modified considerably in both volumes. Both present tables showing the capital engaged in agriculture, gross returns and costs of production per hectare, and distribution of lands. The 1931–32 volume also includes the study of results for that year and a discussion of the profit-making capacity of the farms, 1927–31, and the social income, family farm earnings, and labor costs, 1927–30, 1930–31, and 1931–32. Most of the text is in French. Table headings and notes are also in English.

Ohio agricultural statistics, 1936, G. S. RAY, L. H. WILAND, and P. P. WALLRABENSTEIN. (Coop. U. S. D. A.) (*Ohio Sta. Bul. 593 (1938), pp. 62, fig. 1*).—This bulletin continues the series previously noted (E. S. R., 76, p. 871).

South Dakota farm prices, 1890–1937, T. H. COX and L. M. BROWN (*South Dakota Sta. Bul. 317 (1938), pp. 47, figs. 4*).—Bulletin 259 (E. S. R., 66, p. 189) on prices of farm products is brought up through December 1937, and tables and charts are included showing the composite monthly index numbers of prices for farm products, January 1915–December 1937, and of prices paid by farmers, March 1923–December 1937, monthly prices of different farm products for varying periods, 1890 to December 1937, average prices of different farm products by months, 1931–36 and 1920–30, and the relation of such prices, 1915–37, to the parity price.

Beef feeding costs and returns on 13 Michigan farms, 1936–1937, H. B. TAYLOR (*Michigan Sta. Quart. Bul., 20 (1938), No. 4, pp. 221–224*).—This article presents the findings of an analysis of the cost records of 13 farms in 4 counties. Costs and returns on all farms and the 5 low- and 5 high-cost farms, feeding efficiency, daily gains, etc., are discussed.

Prices of cash and feed crops in Michigan, 1929–37, O. ULREY (*Michigan Sta. Quart. Bul., 20 (1938), No. 4, Sup., pp. 284–299, figs. 3*).—This article summarizes and analyzes farm price and index data on cash and feed crops from 1929 through March 1938, inclusive. Tables show the prices paid farmers for different crops and index numbers of such prices by months January 1929 to March 1938, inclusive, and the averages for the periods 1910–14 and 1924–28.

Egg prices, O. J. BEILBY (*Oxford: Univ. Oxford, Agr. Econ. Res. Inst., 1937, pp. [66, figs. 12]*).—This is a study of the factors affecting prices and production of eggs in Great Britain, 1913–35. Home production, imports, and prices

are discussed, and an analysis is made of the factors affecting prices and production. The average consumption per capita increased from 111 eggs in 1913 to 158 in 1931, then decreased to about 150 for the period 1932–34. The percentage imported decreased from 64 to 32 during the period. Home production, imports, and demand were responsible for 66, 5, and 19 percent, respectively, of the fluctuations in egg prices, 1925–35. Changes of 1 percent in demand (the index of purchasing power), home production, and imports resulted in changes of 2.35, 1.16, and 0.31 percent, respectively, in the prices of eggs.

RURAL SOCIOLOGY

[Investigations in rural sociology by the Ohio Station], C. E. LIVELY. (Coop. U. S. D. A.). (*Ohio Sta. Bul. 592 (1938), p. 117*).—Data are tabulated as to the estimated changes in the farm population of Ohio during the calendar year 1936, and factors are suggested for delimiting rural social subareas of the State.

Drought and depression migration into Oregon, 1930 to 1936, C. S. HOFFMAN (*U. S. Dept. Labor, Bur. Labor Statis., Mo. Labor Rev., 46 (1938), No. 1, pp. 27–35*).—This article deals with the inter-State migrants that have reached the rural and semirural areas of Oregon. Tables are included and discussed showing the estimated number of migrants, previous place of residence of, residence areas in State selected by, and usual occupation of migrants, and the number of migrants on relief.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Farm economics: Management and distribution, F. APP and A. G. WALLER (*Chicago: J. B. Lippincott Co., [1938], rev., pp. 700, figs. [253]*).—This is a revision of the text for high school classes in vocational agriculture and college students previously noted (E. S. R., 60, p. 686).

FOODS—HUMAN NUTRITION

The family's food, F. L. GORRELL, H. McKAY, and F. ZUILL, edited by B. R. ANDREWS (*Chicago: J. B. Lippincott Co., [1937], rev., pp. X+630, figs. 133*).—In this revision (E. S. R., 67, p. 336) the authors have rearranged the subject matter into four sections: Planning and preparing three meals a day, methods and standards in preparation of food, food management, and food and health.

Your diet and your health, M. FISHBEIN (*New York and London: McGraw-Hill Book Co., [1937], pp. X+298, [figs. 6]*).—This volume presents in simple form the essentials of an adequate diet and the effect of diet on the human body in health and in disease. The topics discussed in the 26 chapters include food sensitivities, debunking diets, and peculiar schools of dieting. The appendix contains tables showing the approximate quantities of foodstuffs needed weekly by typical families on adequate diets at minimum cost and restricted diets for emergency use, approximate food value tables, menus for reducing diets, sources of the vitamins, and composition and fuel value of alcoholic beverages.

Food preparation studies, A. M. CHILD and K. B. NILES (*New York: John Wiley & Sons; London: Chapman & Hall, 1938, 2. ed., pp. VII+162*).—The authors have followed the plan used in the first edition (E. S. R., 68, p. 122) of this volume, but have brought the subject matter up to date.

[Food studies by the Indiana Station], R. JORDAN (*Indiana Sta. Rpt. 1937, pp. 64–66, fig. 1*).—Progress reports are given on studies on canned products processed by various methods and the use of hydrogenated lard as a culinary fat (E. S. R., 77, p. 419).

[Food research by the Ohio Station] (*Ohio Sta. Bul. 592 (1938), pp. 92, 110*).—In this progress report data are given by R. G. Washburn, I. C. Hoffman, and W. E. Krauss on the acidity, ascorbic acid content, and total pigment concentration of field tomatoes and by H. McKay and M. B. Patton on the relationship between specific gravity and culinary quality of potatoes.

The counteraction by fat of the anticalcifying action of cereals, E. J. McDougall (*Biochem. Jour., 32 (1938), No. 1, pp. 194–202, pl. 1*).—The Green and Mellanby (E. S. R., 59, p. 292) basal diet, which is low in calcium and vitamin D contents, was supplemented by varying amounts of white and brown flours and white bread, with starch, lard, or olive oil, and was fed to groups of rats. The results were determined by means of roentgenographs, the line test, and ash analysis of the femur.

Rickets developed in the rats maintained on the high cereal diets without fat and in a few of the animals receiving 0.5 part of lard or olive oil. White bread had the same rachitogenic action as white flour. The addition of 11 percent fat free from vitamin D prevented rachitogenic action. Lard proved to be the most effective fat supplement both for protection from rickets and the promotion of growth. It is suggested that the absorption of calcium is promoted by the formation of calcium soaps with the fatty acids present in the fat supplements. In the absence of fat the calcium combines with the phytin to form an insoluble compound which is not absorbed in the intestine of the rat. The author concludes that the rachitogenic action of cereals as demonstrated by Mellanby (E. S. R., 56, p. 92) is due to a deficiency of fat in the diet.

The nutritive value of bread, A. Z. Baker, M. D. Wright, and J. C. Drummond (*Jour. Soc. Chem. Indus., Trans., 56 (1937), June, pp. 191T–194T*).—Using the bio-assay method of Birch and Harris (E. S. R., 73, p. 567), the authors determined the vitamin B_1 content of a number of samples of flours and breads. The following values, expressed as international units of vitamin B_1 per gram are reported: Whole wheat from six sources from 1.2 to 2.6 units, hand-picked germ from 11 to 15, coarse ground meal 1.6, whole meal 1.5, two grades of stone-ground white flour 1.1 and 0.9 units, respectively, white flours milled by modern methods from 0 to 0.3, five samples of white bakery bread from 0.14 to 0.24, one of home-made white 0.14, two of white with malt 0.27 and 0.35, respectively, French loaf 0.28, health loaf (whole wheat and malt) 0.51, two samples of brown bakery bread 0.5 and 0.67, respectively, wheaten loaf 1.1, two of whole meal 1.15 and 1.2, respectively, and three of germ bread 1.2, 1.65, and 1.7 international units per gram, respectively.

A survey of the sale of white and whole meal or brown flour and breads in representative stores located in one section of London showed that from approximately 89 to 97.5 percent of the sales were of white flour and from 80 to 94.5 percent of white bread, with only from 2.5 to 11 percent of the customers buying whole meal flour and from 5.5 to 20 percent buying brown bread.

Report of the 1936–37 A. A. C. C. Committee on Standardization of Laboratory Baking, C. F. Davis (*Cereal Chem., 14 (1937), No. 6, pp. 893–902*).—In this committee report the reasons for test baking, the type and details of the procedure, the development of equipment, the establishment of test baking formulas, the method of reporting and the significance of the results of the tests, and the future of the standard baking test are discussed and recommendations are made.

Factor control in cake baking, J. A. Dunn and J. R. White (*Cereal Chem., 14 (1937), No. 6, pp. 783–801, figs. 10*).—The control of physical factors in the pound cake test method, such as measurement of the specific volume of the

creamed mass of shortening and of the finished cake batter, the selection of a sugar, the storage of the shortening, the variations in liquid necessary for constant consistency of the cake batter, and the effect of humidity is discussed.

The effect of formula and procedure variables upon cake quality, J. R. DAVIES (*Cereal Chem.*, *14* (*1937*), *No. 6*, *pp. 819–833*, *fig. 19*).—The effect upon the cake quality of varying the mixing time, quantity of batter, baking temperature, and the amounts of sugar, fat, liquid, and baking powder in the formula is presented, together with a comparison of the cakes made by varying the sugar, fat, and liquid in the formulas of the A. A. C. C. and laboratory methods as a basis for judging the baking quality of cake flour.

The nutritional value of soybeans, A. A. HORVATH. (Del. Expt. Sta.). (*Amer. Jour. Digest. Diseases*, *5* (*1938*), *No. 3*, *pp. 177–183*).—The author discusses the composition, properties, nutritive value, and uses of soybeans as a food for human consumption. The bibliography lists 114 references.

Whipping ability of soybean proteins, B. MONAGHAN-WATTS (*Indus. and Engin. Chem.*, *29* (*1937*), *No. 9*, *pp. 1009–1011*, *fig. 1*).—An electric mixer was used to measure the whipping quality of a suspension of ether-extracted soybean flour in water. The best product was obtained when the beating was continued for 8 min., with the ingredients at a temperature of 50° C. and a pH of 6.4. The stiff foam produced closely resembled egg white and is recommended as a substitute for the latter in frozen and molded desserts and candies of the divinity type. Due to its inability to coagulate, soybean foam cannot replace whipped egg white in angel food and sponge cakes, pop-overs, meringues, and such dishes as soufflés and fondues without altering the present recipes and methods of manipulation.

By spreading out the soybean flour in a thin layer in an electric oven maintained at a constant pressure of 45 mm mercury and applying the heat at 130° for 20 min., the raw bean flavor was removed without affecting the whipping quality.

The emulsion-foam produced by agitating butter, sugar, and egg: A method for testing the stability of the emulsion and the effect of the conditioning temperature of the fat, E. GREWE (*Cereal Chem.*, *14* (*1937*), *No. 6*, *pp. 802–818*, *figs. 11*).—The emulsion produced by combining 180 g hydrogenated fat or 200 g butter, 400 g sugar, and 200 g egg is shown to be of the water-in-oil type and the fat-sugar foam is of the air-in-oil type. Microscopic observations were made on the structure of the ingredients and the stability of the emulsion was determined by a viscosimeter. A measurement of the stability was also obtained by determining the amount of the aqueous phase which separated out from the emulsion and settled to the bottom of the container. A more stable emulsion is formed when the egg is added slowly to the fat-sugar foam, with the temperature of the fat at from 21° to 23° C. and the specific gravity of the emulsion greater than 0.75. The greatest amount of air was incorporated when hydrogenated fat was used in the formula, less with butter oil, and least with butter.

Honey and health, B. F. BECK (*New York: Robert M. McBride & Co.*, *1938*, *pp. XIV+272*, *pls.* [*16*], *figs. 10*).—This volume, which contains an introduction by E. F. Phillips, is divided into two parts. Part 1 contains information on the physical and chemical aspects of honey as compared to sugar, the nutritive and medicinal values, and the uses of honey in the home. Part 2 is a review of the history of honey. The bibliography lists 335 references.

Basal metabolism of Oklahoma men and children, O. NALBANDOV, V. G. HELLER, E. KRAUSE, and D. I. PURDY. (Okla. A. and M. Col.). (*Jour. Nutr.*, *15* (*1938*), *No. 1*, *pp. 23–26*, *fig. 1*).—The basal metabolic rate of 84 children

ranging in age from 5 to 15 yr. and of 75 men from 17 to 30 yr. of age was determined, using the Benedict-Roth recording metabolism apparatus.

The total heat production averaged 866.85 calories per 24 hr. for 20 girls aged from 5 to 7 yr., 1,332.29 for 16 girls aged from 8 to 11 yr., and 1,713.05 calories for 6 girls aged from 12 to 15 yr., or 43.36, 51.4, and 52.1 calories per square meter of body surface per hour, respectively. The average basal metabolic rates obtained were +3.36, +2.63, and —6.59 percent, respectively. The total heat production averaged 861.6 calories per 24 hr. for 12 boys aged from 4 to 7 yr., 1,457.68 for 24 aged from 8 to 11 yr., and 2,071.01 calories for 6 boys aged from 12 to 14 yr., or 43.2, 54.23, and 63.45 calories per square meter per hour, respectively. The average basal metabolic rates obtained were +1.72, —2.34, and —1.12 percent, respectively. The total heat production averaged 1,762.9 calories per 24 hr. for 27 men aged from 17 to 19 yr., 1,761.3 for 39 aged from 20 to 24 yr., and 1,696.8 calories for 9 men aged from 25 to 29 yr., or 41.03, 38.4, and 37.8 calories per square meter per hour, respectively. The average basal metabolic rates obtained were —4.42, —6.34, and —6.2 percent, respectively.

The basal metabolism of the younger children was found to be in agreement with the Northern standard of DuBois, but fell below the normal with increasing age, the lowering being most marked with the age group of girls at puberty. The average basal metabolism of the men was 5.63 percent below the DuBois standard.

Nutritional status of college women in relation to their dietary habits, H. McKay and M. B. Patton (*Ohio Sta. Bul. 592 (1938), pp. 108–110*).—In this progress report on the North Central States cooperative project, data are given on anthropometric measurements, basal metabolism, blood studies, calcium, phosphorus, and protein balances, and dietary studies.

Some body measurements of Texas school children, J. Whitacre. (Tex. Expt. Sta.). (*Assoc. South. Agr. Workers Proc., 37–38 (1936–37), pp. 254–255*).—This is an abstract of a report on racial differences in weight, standing height, sitting height, and shoulder width of Texas school children (white, Mexican, and Negro) measured in the investigation, other phases of which have been noted previously (E. S. R., 74, p. 877).

Weight of clothing worn by Texas school children, J. Whitacre (*Texas Sta. Circ. 81 (1938), p. 27; also in Jour. Home Econ., 29 (1937), No. 8, p. 573*).—An extension of an earlier study of weight of clothing of San Antonio school children in different seasons of the year (E. S. R., 66, p. 387) to a total of some 1,000 subjects, representing equally the three races in the investigation noted above, is summarized, with the same conclusion that "difference between maximum and minimum clothing weights of individual children equaled or exceeded their own monthly nude body weight changes in a high percentage of cases."

The influence of diet on the nitrogen balances of pre-school children, J. E. Hawks, M. M. Bray, and M. Dye. (Mich. Expt. Sta.). (*Jour. Nutr., 15 (1938), No. 2, pp. 125–143, figs. 2; abs. in Michigan Sta. Quart. Bul., 20 (1938), No. 4, p. 252*).—In continuation of previous investigations (E. S. R., 77, p. 726), the authors determined the variations in the nitrogen balance of six normal preschool children receiving an adequate diet containing 3 g of protein per kilogram of body weight for a period of 21 days. Four of the subjects were studied during a second period of from 15 to 24 days when the diet contained 4 g of protein per kilogram of body weight. The percentage of protein from animal sources, the bulk, the acid-base relationship, the caloric value, and the calcium and phosphorus contents of the test diets remained practically constant.

On the 3-g protein diet the total urinary nitrogen was between 92.4 and 94.6 percent of the intake, with variations in the distribution between urine and feces. The coefficient of digestibility of the same food varied from 86 to 92.7 percent and was quite constant for each child. For the two experiments the correlations between the nitrogen intake and the retention were 0.77 and 0.63, respectively, showing that the children reacted in a similar manner and retained nitrogen in proportion to the period-by-period variations in the diet with the exception of the first 9 days on the high protein diet. On the 4-g diet the total nitrogen excreted was from 90.1 to 93 percent, and the coefficients of digestibility were increased as much as 2.6 percent. During the high protein period all of the children showed more rapid weight gains than on the medium protein diet and were in a fair degree of nitrogen equilibrium during the last 15 days of the experiment.

An apparatus for the measurement of the metabolic rate of small animals, N. T. Werthessen (*Jour. Biol. Chem., 119 (1937), No. 1, pp. 233–239, figs. 2*).—The construction of an essentially automatic device for use in studying the metabolic rate of the rat is described. The rate of oxygen consumption is measured electrolytically and the rate of carbon dioxide produced is measured by the rate of change of the conductivity of sodium hydroxide contained in a chamber upon which the animal chamber floats. The animal chamber is enclosed in a respiration chamber which is connected to the electrolysis cell. The apparatus is equipped with a recording ammeter so that a continuous record of oxygen consumption for a period of 5 days is possible. The device contains a movement recorder by which the grosser body movements are written on the ammeter chart.

Creatine and creatinine excretion in infancy, R. Catherwood and G. Stearns (*Jour. Biol. Chem., 119 (1937), No. 1, pp. 201–214, figs. 4*).—Urinary creatine and creatinine excretions were determined for 75 infants from birth to 1 yr. of age. The infants received human milk for the first 2 weeks and then curded whole milk with 6 percent carbohydrate and containing the customary vitamin supplements. The data were analyzed statistically.

The creatinine-weight coefficient obtained was 0.9056±0.0055, creatinine-length 0.893±0.0065, and creatinine-age coefficient 0.8333±0.0094. The low correlation coefficient of creatinine and age in comparison with the others shows that during the first year of life creatinine excretion is not affected by the age of the infant. While creatinine-weight and length coefficients are almost identical, the coefficient of alienation of creatinine-length is 0.45 as compared to 0.424 for creatinine-weight. It is concluded that the creatinine excretion of infants under 1 yr. of age is a function of body weight and is dependent largely upon the quantity of muscle. An approximate average creatinine excretion per kilogram for infants receiving human milk is given as 10 mg.

The creatine-weight coefficient obtained was 0.7645±0.0128 and the creatine-age coefficient 0.7313±0.0144, with coefficients of alienation of 0.645 and 0.682, respectively. The quantities of creatine excreted daily were far more variable than those of creatinine. No definite relationship was demonstrated between creatine excretion and any phase of nitrogen metabolism, intake, retention, or catabolized nitrogen expressed as urinary excretion. It was noted that both the heat production in calories per kilogram and the creatine excretion increased during early infancy and then remained approximately constant during the remainder of the first year of life. No direct parallelism was observed between the level of protein intake and the creatine excretion. Evidence is presented to show that creatine and creatinine excretions represent different phases of muscle metabolism.

Calcium and phosphorus deficiencies in a poor human dietary, W. E. GAUNT, J. T. IRVING and W. THOMSON (*Brit. Med. Jour., No. 4031 (1938), pp. 770–773, fig. 1*).—Following the procedure described by Orr et al. (E. S. R., 75, p. 880), three groups of rats were placed on a diet approximating closely the average diet of a working class community in Scotland as follows: (1) Unsupplemented, (2) milk and green vegetables added to raise the calcium and phosphorus contents from 0.121 and 0.249 percent, respectively, to 0.284 and 0.338 percent, and (3) calcium and phosphorus salts added equivalent to the amounts in diet 2. Twelve rats of each sex were kept for breeding and four were killed for examination at 40, 70, and 100 days of age. The growth rates of the male rats in the two groups on diets 2 and 3 were identical and were higher than those of the male rats on diet 1. Similarly, the females showed greater weight gains but at a lower level than the males. In the second generation the growth rates of the rats receiving diet 3 exceeded those of the animals on diet 1, but were less than those of the group on diet 2. X-ray examination showed a superior degree of calcification in the rats on diets 2 and 3, and histological examination of the teeth revealed a normal state of calcification, while the rats on diet 1 were definitely below normal in bone and tooth development. Similar results were shown by chemical analyses of the bones and teeth, the degree of difference among the three groups being smallest for the tooth ash values. The number of rats per litter produced by the animals on diet 1 averaged 8.7 as compared to 9.7 and 10, respectively, and the average weight of the young at birth averaged 5.3 g as compared to 5.36 and 5.48 g, respectively, for the other two groups. It is concluded that the addition of calcium and phosphorus in the form of milk and green vegetables greatly improved the nutritive value of the diet.

Urinary iron excretion, A. P. BARER and W. M. FOWLER (*Jour. Lab. and Clin. Med., 23 (1937), No. 2, pp. 148–155*).—The urinary iron excretion of 200 hospitalized men and women between the ages of 17 and 78 yr. on the ordinary hospital diet was determined, using an adaptation of the Reis and Chakmakjian colorimetric method (E. S. R., 67, p. 105). Iron supplements in the form of 3 g iron and ammonium citrates were given to 10 subjects. No correlation was demonstrated between the hemoglobin level (as determined by the Newcomer method) and the amount of iron excreted, nor between the volume of urine and the urinary iron. Hematocrit readings by the Van Allen method varied from 5.5 to 51 percent in the men and from 17 to 48 percent in the women. The addition of the iron supplement did not appreciably change the urinary iron excretion. Redeterminations made on 10 other subjects after an interval of from 30 to 235 days did not vary by more than 0.1 mg of iron per day from the previous determinations. It is noted that 14 patients with idiopathic hypochromic anemia had an average urinary iron excretion approximately 63 percent greater than the average for the entire group.

Reliability of the thiocyanate method for the determination of iron in acid digests of food and feces, R. M. LEVERTON. (Nebr. Expt. Sta.). (*Jour. Home Econ., 30 (1938), No. 4, pp. 252–257*).—The method described in a report noted previously (E. S. R., 78, p. 568) was evaluated by application to the recovery of iron from standard solutions and from sulfuric acid aliquots of food and feces.

The recovery of iron from standard solutions ranged from 99 to 102 percent and averaged 100.2 percent, and from the food and fecal digests ranged from 98 to 102 percent and averaged 100.7 percent. The use of 100-cc in place of 50-cc aliquots of food digests lowered the difference in the iron content of

four composite samples from the same digest from a range of from 4.5-8 to 0.9 percent for a subject on a low fat diet and from 6.7–10.2 to 1.9 percent for a subject on a high fat diet. Similarly, the use of 50-cc in place of 25-cc aliquots of fecal digest lowered the difference in iron content from 5.9–13.4 percent to 0 6–1.5 percent and from 3.6–10.1 percent to 0–1.8 percent, respectively. From these percentage differences a maximum allowable variation of 2 percent was established for the results from the analysis of samples from the same digest.

A second series of ashings was made after thorough mixing of the digests, and samples were analyzed after a 3-mo. interval and compared with the previous analyses. Two composite samples of food digests from the diet low in fat differed by 0.9 and 0 percent and two from the diet high in fat both differed by 0.7 percent. Similarly, two composite samples of fecal digests both differed by 0.9 percent and by 0 and 0.6 percent, respectively. The iron content of identical food composites for a 5-day period made by the same person at the same time differed by 1.3 percent. It is concluded that a difference of 1 percent is permissible in the results of iron determinations of the same ash solution and a maximum difference of 2 percent in the results of determinations of different ash solutions made from the same digest.

The biological standardisation of the vitamins, K. H. COWARD (*London: Baillière, Tindall & Cox, 1938, pp. VIII+227, [pls. 7], figs. [35]*).—The first half of the book is devoted to discussions of the general principles underlying biological determination of the vitamins, the animals suitable for biological standardization, the various methods for standardization of the vitamins A, B_1, C, and D, and the interdependence of the vitamins. In the second half the author applies statistical methods to show how much the bio-assay results are affected by variations between individual animals and considers statistically each of the methods of determining the vitamins A, B_1, C, and D from the point of view of the accuracy obtainable. The appendix contains a brief account of the second conference (1934) of the League of Nations Commission on Vitamin Standardization (E. S. R., 71, p. 740) and a table showing the vitamin A, B_1, and D content of a few foods expressed in international units per gram. The 119 references to the literature are given at the ends of the chapters.

The distribution of vitamin A and factor A_2, I, J. R. EDISBURY, R. A. MORTON, G. W. SIMPKINS, and J. A. LOVERN (*Biochem. Jour., 32 (1938), No. 1, pp. 118–140, figs. 2*).—Data are presented on the distribution of vitamin A and the 693 mμ chromogen (factor A_2) in 10 species of fresh and salt water fishes and in the rabbit. It is noted that in some species of fish the organs other than the liver contain substantial amounts of vitamin A, and in the herring the content is equal to that of the liver. The presence of vitamin A in the absorptive portions of the alimentary tract of carnivorous fish, which exist largely on fat and protein, suggests that the vitamin is concerned with the assimilation of either fat or protein, or both. Factor A_2, which was found in trout to a greater extent than vitamin A, was also demonstrated in smaller amounts in the eyes, liver, or viscera of goldfish, salmon, and perch. In the rabbit the liver is the chief storage organ of vitamin A, and factor A_2 is not present.

Conditions influencing the storage of vitamin A in the liver, T. THORBJARNARSON and J. C. DRUMMOND (*Biochem. Jour., 32 (1938), No. 1, pp. 5–9*).—A diet consisting of 10 percent casein, 18 starch, 50 glucose, 12 lard, 5 yeast extract, and 5 percent salt mixture was fed to seven groups of rats for 4 weeks (1) without modification, (2) the fat content increased to 40 percent,

(3) 2 percent choline hydrochloride added to diet 2, (4) the fat content at 28 percent and 2 percent cholesterol added, (5) 2 percent choline hydrochloride added to diet 4, (6) the fat replaced by carbohydrate, and (7) 2 percent choline hydrochloride added to diet 6. The rats received 3.6 mg of cod-liver oil containing 1,800 international units of vitamin A per gram per day. The following values are reported for the fat content of the livers of the rats on the seven diets: 8.95 percent, 26.21, 5.52, 41.28, 18.13, 5.31, and 4.68 percent, respectively. The total amounts of vitamin A stored, as determined by the Hilger "Vitameter A," were 9.64, 20.4, 10.7, 23.3, 14.5, 9.85, and 7.87 international units, respectively.

In a second series of tests rats previously receiving diet 6 were (1a) continued on the diet, (2a) given vitamin A for 4 weeks and then divided into three subgroups with one subgroup killed and the other two given (3a) diet 6 for 9 days and (4a) diet 7 for 9 days, (5a) given diet 2 supplemented with vitamin A for 4 weeks and then divided into three subgroups with one subgroup killed, one (6a) continued on diet 2 and the other (7a) given diet 7. The following values are reported for the fat content of the livers of the rats on the seven diets: 4.98 percent, 5.13, 5.17, 4.76, 11.12, 8.71, and 6.28 percent, respectively. The total amounts of vitamin A stored were 13, 400, 26, 48, 900, 300, and 120 international units, respectively.

It would appear that the "storage of vitamin A in the liver is facilitated by the presence of fat in the diet and its subsequent deposition in the liver." The addition of choline, which prevented the accumulation of fat in the liver or dispersed the excess fat present in that organ, tended to accelerate the disappearance of vitamin A from the liver.

The relationship of vitamin A to the health of infants, J. M. Lewis and L. H. Barenberg (*Jour. Amer. Med. Assoc., 110 (1938), No. 17, pp. 1338–1341*).—This continuation of a series of papers previously noted (E. S. R., 71, p. 135) reports the results of a study made on 104 infants. One group of 51 received a partly skimmed dried milk diet with orange juice added at 6 weeks, cereal at 4 mo., and vegetables other than spinach and carrots at 6 mo. and supplemented by 15 drops of viosterol daily to make a vitamin A content of approximately 500 international units for the 0- to 3-month-, 750 for the 3- to 6-month-, and 1,050 units for the 6- to 9-month-old group. The other group of 53 infants was given the same diet with halibut-liver oil, so that the three age groups received approximately 17,165, 17,415, and 17,715 international units of vitamin A per day, respectively.

The three groups on the low vitamin A diet had 1.9, 2.6, and 3.1 infections per infant, respectively, and a total of 133 infections during the 7-mo. period as compared to 2.7, 2.5, and 3.1, respectively, and a total of 144 infections for the three groups on the high vitamin A diet. No significant difference was noted between the two groups in the incidence of cutaneous infections, conjunctivitis, and vaginitis, and no cornification of the epithelial cells was present in the infants on the low vitamin A diet. The average gain in weight per month for the low vitamin A group was 27.8 oz. for the 0- to 3-month-old infants, 24.9 for the 3- to 6-month-old, 17.6 for the 6- to 9-month-old, and 9.8 oz. for the 9- to 12-month-old infants as compared to 30, 24.5, 17.9, and 9.3 oz., respectively, for the high vitamin A group. It would appear that the infants receiving about one-fourth the amount of vitamin A generally prescribed by the physician were in as good a state of health as were the infants receiving from 17 to 34 times as many units of vitamin A. The authors conclude that "the average diet of infants contains at least 4 times as many units as the minimum requirement, as judged by the nutritional state of infants and their resistance to infections."

Nutrition surveys: Vitamin-A deficiency among school-children in London and Cambridge, M. K. Maitra and L. J. Harris (*Lancet [London] 1937, II, No. 18, pp. 1009–1014, fig. 1*).—Using a modification of the first method described by Jeans and Zentmire (E. S. R., 71, p. 566) of measuring the dark adaptation by means of the Birch-Hirschfeld photometer, the authors conducted a survey of 223 elementary school children and 60 adults. Control tests were made on some of the children after about 14 to 28 days, with and without the addition of vitamin A to the diets. The incidence of hypovitaminosis-A was found to be high among the boys and girls of the poorer class, about 27 percent of the 193 children in the group being slightly below normal and 30 percent definitely subnormal as compared to 10 percent and 0, respectively, for 30 public school boys who were well nourished. Among 38 adult women the incidence was 50 percent normal and 50 percent slightly below normal, and in 22 adult men 14 percent were slightly below and 5 percent definitely below normal in vitamin A nutrition. The administration of vitamin A in the form of 15 drops of halibut-liver oil (British Drug Houses) daily to 40 subnormal children resulted in the return to normal of 30 and improvement in 9 in 4 weeks, while of 20 untreated children only 2 showed any improvement. The highest incidence of vitamin A deficiency was found among the younger children and the lowest among the adults.

Value of a cod liver oil concentrate in preventing weight loss in the new-born, J. R. Dolce (*Arch. Ped., 55 (1938), No. 3, pp. 185–190*).—The effect upon the weight changes during the first 10 days of life was observed in 39 breast-fed infants, of whom 22 were given cod-liver oil containing 3,420 U. S. P. units of vitamin A and 484 of vitamin D daily by mouth. In this group, 20 regained their birth weight or exceeded it by from 1 oz. to 1 lb. 5 oz. and 2 failed to regain their birth weight by 1 and 4 oz., respectively. Of 17 infants bathed twice daily with 3 teaspoonfuls of an antiseptic oil enriched with vitamins A and D and standardized to contain 612 units of vitamin D per ounce, 13 regained their birth weight or exceeded it by from 3 oz. to 1 lb. 9 oz., while 2 infants who were weighed at the end of the test period both had weight losses of 1 oz. In a control group of 25 infants, 12 regained their birth weight or showed additional increases of from 1 oz. to 1 lb. and the remaining 13 had weight losses varying from 1 to 14 oz. below their birth weight. It would appear that cod-liver oil given orally or by topical application is effective in preventing the reduction of weight loss in the newborn.

Note on the vitamin-B_1 content of various kinds of bread and flour, L. J. Harris and P. C. Leong (*Jour. Soc. Chem. Indus., Trans., 56 (1937), June, pp. 195T, 196T*).—This report has been essentially noted from another source (E. S. R., 78, p. 569).

The beriberi vitamin, R. R. Williams (*Indus. and Engin. Chem., 29 (1937), No. 9, pp. 980–984, figs. 5*).—The isolation of vitamin B_1 (beriberi vitamin) and its structure and synthesis are discussed. The best sources are stated to be the bran coats of whole cereals, ripe peas, beans, and lean pork.

"Alcoholic" beri-beri, N. L. Price (*Lancet [London], 1938, I, No. 15, pp. 831–834, figs. 2*).—The case history of an adult male alcholic with cardiac failure and polyueuritis who had for some time subsisted on a very poor diet and for 2 weeks before entering the hospital largely on alcohol is presented. After 3 weeks of hospitalization on a high caloric diet supplemented with large amounts of vitamin B_1, the cardiovascular system returned to normal and at the end of 3 mo. the central nervous system was normal. The resemblance to the clinical picture produced in "wet" beriberi is noted. The author suggests the modification of Cowgill's concept to the extent that "the vitamin B_1 require-

ment of an individual depends not only on the rate but also on the type of tissue metabolism, and equally, therefore, not only on the total calorie intake but also on the kind of calories ingested."

Vitamins in relation to the prevention and treatment of pellagra, W. H. SEBRELL (*Jour. Amer. Med. Assoc., 110 (1938), No. 20, pp. 1665–1672*).—This review paper deals with the relationships between the human pellagra-preventive factor and riboflavine or vitamin B_2 (G), vitamin B_6 or the rat antidermatitis factor, the filtrate factor or chick pellagra factor, and the blacktongue preventive factor; the possibilities of deficiencies of more than one factor in pellagra; the action of sunlight and the effect of administering liver extracts, yeast, and nicotinic acid as supplements to the therapeutic diet; the prevention of recurrence of pellagra by dietary measures; and the distribution of powdered yeast as a palliative measure and the use of home-produced foods containing the pellagra-preventive vitamin by the people living in regions where the disease is endemic. A table is presented showing the pellagra-preventive value of approximately 40 foodstuffs which have been tested under control conditions in human patients and/or in dogs. The bibliography lists 94 references.

Panmyelophthisis with hemorrhagic manifestations in rats on a nutritional basis, P. GYÖRGY, H. GOLDBLATT, F. R. MILLER, and R. P. FULTON (*Jour. Expt. Med., 66 (1937), No. 5, pp. 579–602, pls. 6*).—In continuation of previous studies (E. S. R., 75, p. 282), the authors present evidence, based on anatomical and histological examinations and morphological study of the blood, of the existence of anemia and hemorrhagic manifestations in rats maintained on a vitamin B_6-deficient diet consisting of purified casein 18 percent, cane sugar 68, melted butterfat 9, McCollum 185 salt mixture 4, and cod-liver oil 1 percent, supplemented by 3 pigeon units of vitamin B_1 and 10γ crystalline lactoflavine daily. Vitamin B_6 administered to test rats cured symptoms of acrodynia but failed to remove symptoms of the disease known as panmyelophthisis. The administration of crude concentrates of vitamin B_6, such as Peter's eluate, yeast, cow's milk, human milk, liver, or wheat germ autolysate prevented the anemia symptoms, and the substitution of Peter's eluate for the lactoflavine in the diet prevented or cured the anemia and hemorrhagic manifestations.

It is suggested that Peter's eluate contains another factor of the vitamin B_2 group different from lactoflavine, vitamin B_6, and probably the filtrate factor, which is concerned with maturation of the reticulo-endothelial cells. Bacteriological examination failed to reveal any evidence that infection plays an important etiologic role in the production of panmyelophthisis. The human counterpart of panmyelophthisis is stated to be aleukia hemorrhagica.

The function of vitamin C (*Internatl. Med. Digest, 32 (1938), No. 5, pp. 307–313*).—A review of recent literature with 42 footnote references.

Study of the exchanges of vitamin C between mother and nursing infant [trans. title], W. NEUWEILER and J. HUBSCHER (*Presse Méd. [Paris], 46 (1938), No. 37, pp. 734–736*).—This is a general discussion of the investigations of the authors on ascorbic acid metabolism and requirements of pregnant and lactating women and nursing infants. It is shown that the need of vitamin C increases with pregnancy, and that the fetus receives its vitamin C entirely from the maternal blood acting as a parasite at the risk of compromising maternal nutrition. It is pointed out that human milk is from six to seven times as rich as cow's milk in vitamin C, although varying widely in its vitamin C content, and that whole milk does not lose its vitamin C content as rapidly as skim milk. In general infants receiving breast milk excrete a much larger quantity of vitamin C than those on cow's milk or mixed feeding. Mothers of

infants subsisting entirely on breast milk have a much lower concentration of vitamin C in the blood than those on the the same diet whose infants are only partially breast fed. The importance of safeguarding pregnant and lactating women against vitamin C deficiency is emphasized.

Combined ascorbic acid in plant tissues, E. J. REEDMAN and E. W. MCHENRY (*Biochem. Jour., 32 (1938), No. 1, pp. 85–93, pl. 1, figs. 4*).—In continuation of previous studies (E. S. R., 75, p. 572), the authors demonstrated the presence of a protein ascorbic acid complex in tissue samples from 15 vegetables, including 10 varieties of potatoes. The complex is first separated from uncombined ascorbic acid in a water extract of the plant tissue by the addition of trichloroacetic acid or metaphosphoric acid, which precipitates the protein ascorbic acid complex and leaves the reduced and reversibly oxidized ascorbic acid in solution. The precipitate is then hydrolyzed by hydrochloric acid in from 0.2- to 1-percent solution and the protein separated from the ascorbic acid by the addition of both metaphosphoric acid and trichloroacetic acid, which now precipitates the protein, leaving reduced ascorbic acid in solution. No proof was obtained as to whether the protein ascorbic acid complex is a chemical compound or an adsorption complex. Spectrographic examination confirmed the chemical titration findings that reduced ascorbic acid is hydrolyzed from the protein precipitate. Biological assay showed that the protein ascorbic acid complex was antiscorbutic in guinea pigs. It is concluded that the guinea pig is capable of hydrolyzing the complex in the digestive tract to yield reduced ascorbic acid which is utilized by the body.

Ascorbic acid in bronchial asthma, H. B. HUNT (*Brit. Med. Jour., No. 4030 (1938), pp. 726, 727*).—On the theory that ascorbic acid may exert a sparing action on adrenalin through preventing its oxidation, the possibility that asthmatic symptoms might be prevented through large doses of ascorbic acid was tested on 16 female and 9 male asthmatic patients, including 5 children. Other allergic symptoms were present in 17 cases and chronic bronchitis in 9. None of the patients after oral treatment for several weeks with 100 mg of ascorbic acid daily showed any marked improvement in asthmatic symptoms or general condition. In another group of 5 patients given massive doses of ascorbic acid by injection when symptoms were present, there was no relief after a period of from 20 to 30 min. and no difference in the amount of adrenalin required for relief.

A possible case of low renal threshold for ascorbic acid, C. A. MAWSON (*Lancet [London], 1938, I, No. 16, pp. 890, 891*).—In a case of suspected scurvy in a woman patient, preliminary urine and blood tests gave an ascorbic acid excretion value of 39.6 mg per 24 hr. and a low fasting plasma value of 0.5 mg per 100 cc. Following a 600-mg test dose administered orally, 51 percent was excreted within the first 3-hr. period and only 44 percent in the next 3 hr. At the peak of excretion the plasma value was only 1.65 mg per 100 cc, falling 5 hr. later to 1.15 mg. The patient was then given 500 mg of ascorbic acid daily for 12 days, following which after an interval of 27 hr. with no additional vitamin C a 3-hr. urine sample contained 33.8 mg and the plasma value was 1.44 mg per 100 cc. The scorbutic symptoms (hemorrhagic gums) and the general condition were much improved. It is suggested that the condition of the patient may have been due to an abnormally low renal threshold for ascorbic acid.

Determination of vitamin C saturation: A five hour test after an intravenous test dose, I. S. WRIGHT, A. LILIENFELD, and E. MACLEANTHEN (*Arch. Int. Med., 60 (1937), No. 2, pp. 264–271, figs. 3*).—To determine the length of time between the intravenous injection of ascorbic acid and its excretion by the kidneys, urine was collected for ascorbic acid determinations in 3-min. samples

continuously for 15 min. from catheters introduced into the right and left ureters of normal adults who, after control specimens had been obtained, were given an intravenous injection of 1,000 mg ascorbic acid in 10 cc physiological salt solution. The rise in ascorbic acid occurred universally between the third and sixth minute and continued until a peak was reached betwen the first and second hour, after which there was a rapid fall in concentration until the fifth hour, at which time in normal subjects at least 500 mg of ascorbic acid or half the test dose had been excreted. The actual quantity excreted in 24 hr. by various subjects depended upon the state of saturation, but in all cases 80 percent or more of the total excretion took place in the first 5 hr.

These observations were verified in a series of tests in which the ascorbic acid content of the urine voided during the first 5 hr. after the intravenous injection of 1,000 mg of ascorbic acid was compared with that of the remaining 19 hours' collection. The samples were collected in dark brown bottles, acidified to pH 3 with sulfuric acid, and kept at ice box temperature. The samples collected during the day were analyzed promptly and the night samples early in the morning. Titration was with 2,6-dichlorophenolindophenol. On the day preceding the test, control values were obtained for blood and 24-hr. urines. In general the subjects with the best dietary history, control blood level, and control 24-hr. urine excretion gave the highest responses. In all but three cases 80 percent of the entire excretion of ascorbic acid was within the first 5 hr., and in these three cases, who were in the normal group, at least 75 percent of the excretion was within the first 5 hr.

Vitamin C deficiency in peptic ulceration estimated by the capillary resistance test, G. BOURNE (*Brit. Med. Jour., 4027 (1938), pp. 560–562*).—The capillary fragility test by the positive technic of Göthlin was applied to 87 subjects, including normals, patients suffering from miscellaneous diseases other than ulceration, and patients with gastric or duodenal ulcer.

In comparison with the Göthlin standards of from 0 to 4 as the normal range of petechiae, from 5 to 8 a transitional stage of vitamin C deficiency, and more than 8 as a definite deficiency, only 2 of the 22 controls gave values above 4 (6 and 9 petechiae), while of the 28 patients with gastric ulcer only 6 gave values under 4 and 7 values above 8. Of the 14 duodenal ulcer cases, 8 gave values of 4 and under and 4 values above 8. In the group of 23 with other diseases than ulcer, 17 gave values of 4 and under and 3 values over 8.

Examination of the records of the patients indicated that the degree of capillary fragility was related to the inadequacy of the ulcer diets in vitamin C. "The genesis of peptic ulcer could not be correlated definitely with deficiency of antiscorbutic vitamins in the diet, but the possibility that it may play a part in some cases cannot be excluded. It seems more likely that the deficiency of antiscorbutic vitamins in the therapeutic diet may be a factor influencing the transition from the acute to the chronic condition, predisposing to delay in healing, relapses, and possibly hematemesis, but of this we have at present no definite proof."

Treatment of psoriasis by ingestion of massive doses of vitamin D, L. A. BRUNSTING (*Mayo Found. Med. Ed. and Res., Proc. Staff Mtgs. Mayo Clinic, 13 (1938), No. 18, pp. 280–283*).—The administration to 9 men and 10 women with psoriasis of from 100,000 to 500,000 U. S. P. units of vitamin D daily for periods varying from about 6 weeks to 7 mo. resulted in cures in 3 cases, marked improvement in 7, slight improvement in 5, and no benefit in 2, while the condition became slightly worse in the remaining 2 cases. It is noted that the results are less favorable than those of Ceder and Zon (E. S. R., 78, p. 895).

The value of irradiated milk in infant feeding, W. H. CLARK (*Arch. Ped., 55 (1938), No. 3, pp. 178–184*).—X-ray films of 43 hospitalized bottle-fed infants

varying in age from 1 to 20 mo. showed that 9 were normal, 15 had early rickets, 10 moderate and 7 advanced rickets, and 2 had scurvy. Following a period covering the 4 winter months when the milk was irradiated to supply 60 Steenbock units of vitamin D per quart, the X-ray films of the 32 rachitic infants showed complete healing in 14, improvement in 12, no change in 5, and more severe rickets in 1 infant.

Biological assay of vitamin E: Application to wheat germ and wheat germ oil, L. S. PALMER. (Minn. Expt. Sta.). (*Indus. and Engin. Chem., Analyt. Ed.*, *9* (*1937*), *No. 9, pp. 427–429*).—The author presents the details of conducting a vitamin E assay on rats by a modification of the vaginal smear technic and discusses the statistical interpretation of the experimental results. The test is shown to be merely a general quantitative assay and is recommended for use in comparing the vitamin E content of different foodstuffs.

The concentration and properties of vitamin H, L. E. BOOHER (*Jour. Biol. Chem.*, *119* (*1937*), *No. 1, pp. 223–231*).—The preparation of a concentrate of a heat-stable component of the vitamin B complex from whey powder low in lactose and from rice polishings is described. The vitamin, which the author designates "vitamin H," is shown by biological tests to be essential for growth and the prevention of erythredemic dermatosis in rats maintained on a diet consisting of purified casein 18 percent, Osborne and Mendel salt mixture with copper sulfate 4, agar 2, cod-liver oil 4, corn oil 4, and cornstarch 68 percent, supplemented by 20 μg of crystalline vitamin B_1 and 20 μg of riboflavine per day. Expressed in terms of growth units, 1 unit of the vitamin being carried by that quantity of a preparation which will support growth at the rate of 3 g per week over a 4-week test period, two samples of rice polishings were found to contain 12 and 13 units of vitamin H per gram, respectively. The author notes that vitamin H apparently possesses a combination of the properties of two or more of the following factors in the vitamin B complex: The filtrate factor, vitamin B_6, and the precipitate factor from liver (E. S. R., 75, p. 889).

Vitamin K (*Brit. Med. Jour., No. 4036* (*1938*), *p. 1060*).—In this editorial comment a concise summary is given of the occurrence, physical and chemical properties, and functions of vitamin K (E. S. R., 78, p. 725), methods used in its determination, and results of its use with bile or bile salts in the clinical treatment of obstructive jaundice.

The treatment of nutritional anemia in rats with meat, L. K. CAMPBELL (*Jour. Lab. and Clin. Med.*, *23* (*1938*), *No. 4, pp. 358–360, figs. 3*).—Red blood cell counts and hemoglobin determinations by the Sahli method were made weekly on three 32-day-old female rats maintained on a whole milk diet supplemented by powdered ground lean beef round when the hemoglobin values reached the lowest level. A group of 15 rats received the whole milk and meat diet for 142 days and remained in an excellent state of nutrition, with red blood cell count and hemoglobin at normal levels.

The red blood cell counts of the three rats increased from 4,030,000, 6,080,000, and 6,130,000 to 10,000,000, 9,960,000, and 8,900,000, respectively, after 34, 41, and 46 days on the whole milk and meat diet. The hemoglobin values as compared to human (100 percent equals 16.9 g hemoglobin per 100 cc of blood) increased from 30, 50, and 69 to 115, 112, and 119 percent, respectively. It is concluded that ground lean beef desiccated at 56° C. in a vacuum "is an excellent source of iron for the treatment of secondary anemia produced by malnutrition."

Effectiveness of arachidonic acid in curing "fat deficiency" disease, O. TURPEINEN (*Soc. Expt. Biol. and Med. Proc.*, *37* (*1937*), *No. 1, pp. 37–40, fig. 1*).—Rats maintained on a fat-low, casein-sucrose-salt diet supplemented

with yeast and the nonsaponifiable fractions from cod-liver oil and wheat oil until growth ceased, as shown by a constant or slightly decreasing weight over a 30-day period, were given arachidonic acid in the form of 33- and 100-mg supplements of methyl arachidonate. The curative effect of the arachidonic acid was measured by comparing the growth response of the rats with that of another group receiving a supplement of linoleic acid in the form of methyl linoleate. The results show that arachidonic acid is approximately three times as effective as linoleic acid in curing the fat deficiency disease.

TEXTILES AND CLOTHING

Comparison of three methods for determining the breaking strength of cotton fibres, M. A. Grimes. (Tex. Expt. Sta.). (*Textile Res., 7 (1937), No. 3, pp. 145–148, figs. 2*).—The application to cotton fibers of a modification of the flat-bundle method for determining the tensile strength of rayon and silk fibers is described. Combed bundles of parallel fibers were placed within a ¾-in. space in a cutting gage made from strips of transparent celluloid joined with a hinge of adhesive tape and were cut to a ½-in. length, weighed, taped with drafting tape, and broken in a fabric breaking strength machine. The strength in pounds per gram of cotton was calculated by dividing the machine break by the weight of the cotton. The strength per cross section of area was determined from the formula: $\text{Strength}=\frac{\text{machine break}}{\text{area}}$, when the area is calculated from the formula: $\text{Area}=\frac{\text{weight}}{\text{density}\times\text{length}}$.

The modified method, which is known as the cut-weighed-taped method, was tested on 23 samples of cotton fibers, and the results were compared with those obtained by the Chandler bundle method by which the breaking strength per cross section area is determined on the basis of the circumference and with a third method by which the strength of an individual fiber is determined and the average of a large number of determinations is assumed to be the breaking strength. By statistical analysis of the data the cut-weighed-taped method yielded a score of 72 as compared to 73 for the Chandler and 58 for the other method. The modification of the flat-bundle method is deemed as accurate as the Chandler bundle method, and has the advantage of saving considerable time and energy and not requiring the special cutting jaws and wrapping device.

Cotton-fiber strength by modified flat-bundle test, M. A. Grimes. (Tex. Expt. Sta.). (*Textile World, 87 (1937), No. 1, p. 92, figs. 2*).—Essentially noted above.

Methods for determining the physical characteristics of cotton fibers, M. A. Grimes (*Texas Sta. Circ. 81 (1938), p. 27; also in Jour. Home Econ., 29 (1937), No. 8, p. 572*).—The methods noted are determination of strength of cotton fibers by the modified flat-bundle technic described above, fineness by planimeter measurements of cross sections of the fiber at high magnification, and maturity ratings by either the sodium hydroxide or polarized light methods.

A photoelectric sorter for length measurements of fibers of seed cotton, B. Johnson. (Ark. Expt. Sta.). (*Jour. Agr. Res.* [*U. S.*], *57 (1938), No. 1, pp. 41–56, figs. 3*).—A basic design for a device for rapidly sorting as to length, cotton fibers (attached to the seed) by use of a photoelectric cell, with necessary accessory apparatus for control of constancy of the light source, is described, and comment is made on sources of error and possible improvement of technic and construction. Comparable resnlts were obtained on the same samples when sorted by two operators using different photoelectric sorters not

to Dr. Charles O. Swanson, head of the department of milling industry. R. J. Eggert has been appointed assistant professor of agricultural economics.

Louisiana University and Station.—Under a proposed expansion of the land utilization program of the university, Dr. Bueford M. Gile, who for the past 3 years has been in charge of the Federal Land Utilization program for Louisiana, Arkansas, and Mississippi, has been appointed professor of land economics and public finance. Other appointments include B. D. Gibbens as assistant agronomist vice H. C. Lovett, resigned to accept a position with the Louisiana Polytechnic Institute, and W. D. Poole as assistant agricultural engineer for full time research, a part of which will be the soil erosion project that is being carried on at Baton Rouge in cooperation with the U. S. D. A. Soil Conservation Service.

Massachusetts College and Station.—John E. Ostrander, associated with the department of mathematics from 1897 until his retirement in 1935 and meteorologist of the station from 1897 to 1928, died October 19 at the age of 73 years.

Montana College and Station.—Dr. E. J. Wellhausen, associate professor of agronomy and associate agronomist, resigned effective October 1 to accept a position as associate geneticist in the West Virginia University and Station.

Cornell University and Station.—The recent deaths are noted of George W. Cavanaugh, professor emeritus of agricultural chemistry; Merritt W. Harper, professor of animal husbandry; Olin W. Smith, secretary of the Colleges of Agriculture and Home Economics; Dr. James E. Boyle, professor of rural economics; and Dr. T. L. Lyon, retired in 1937 as head of the department of agronomy.

North Dakota College and Station.—Dr. Frank L. Eversull, formerly president of Huron College of South Dakota, was inaugurated as president at exercises held October 28.

A micromill and macaroni testing equipment have been added to the cereal technology department to facilitate research on hard spring and durum wheats. A new station publication, the *Bimonthly Bulletin*, is being issued, the main object of which is to aid in keeping residents of the State in closer contact with the work of the station.

Pennsylvania Station.—Dr. W. T. Thorp, instructor and research assistant in animal pathology in the Michigan College and Station, has been appointed assistant professor of animal pathology (research). Otto Olson, for more than 25 years in charge of tobacco experiments carried on in Lancaster County by the college and the U. S. Department of Agriculture, died August 18.

New Journals.—*Jornal de Agronomia* is being published at Piracicaba, São Paulo, Brazil, as the organ of the Agronomic Syndicate of the State of São Paulo. Besides announcements and other miscellaneous information, the initial number contains the following articles: Dichogamy in the Flowers of the Avocado, by J. F. Lima (pp. 3–18); A Contribution to the Study of the Raboso Grape, by J. R. de Almeida (pp. 19–56); An Interesting Case of Incompatibility in the Grafting of Citrus, by S. Moreira (pp. 57–62); and The Value of Exploring the Cerrados, by P. W. C. de Vasconcellos (pp. 63–74).

La Cooperativa is being published at Bogotá by the Ministry of Agriculture and Commerce of Colombia. The initial number contains a discussion of the nature and objectives of cooperation, by A. Hermes, the text of an agricultural cooperation law, data on new cooperatives, three articles on agricultural cooperation in the United States, and other information on the subject.

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